THE A. LIETZ COMPANY

SAN FRANCISCO U.S.A.

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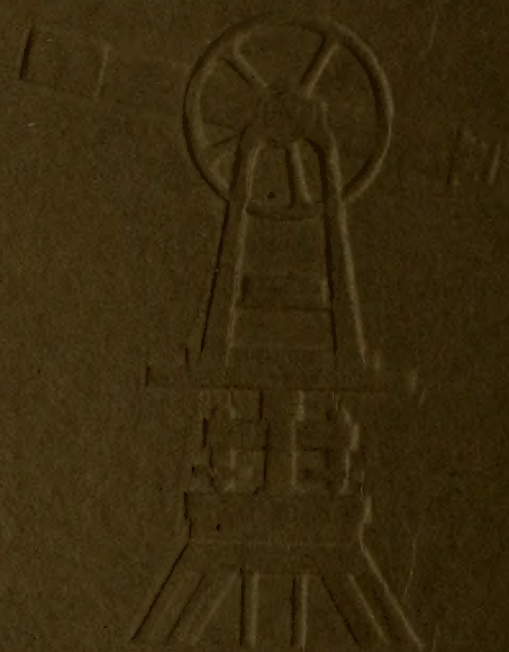


THIS TEXT BOOK AND CATALOGUE IS RESPECTFULLY DEDICATED TO THE MEMBERS OF THE ARCHITECTURAL AND ENGINEERING PROFESSIONS FOR THEIR GUIDANCE IN THE SELECTION OF SUITABLE MATERIAL FOR FIELD & OFFICE USE

THE A. LIETZ COMPANY

H. L. McCready

MANUFACTURERS OF

ENGINEERING, SURVEYING, MINING *and* NAUTICAL INSTRUMENTS

DRAWING MATERIALS
FIELD EQUIPMENT

THE A. LIETZ COMPANY

Established 1882

MAIN OFFICE *and* SALESROOMS: 61 POST ST.
FACTORY: 632-648 COMMERCIAL ST.
SAN FRANCISCO, U. S. A.

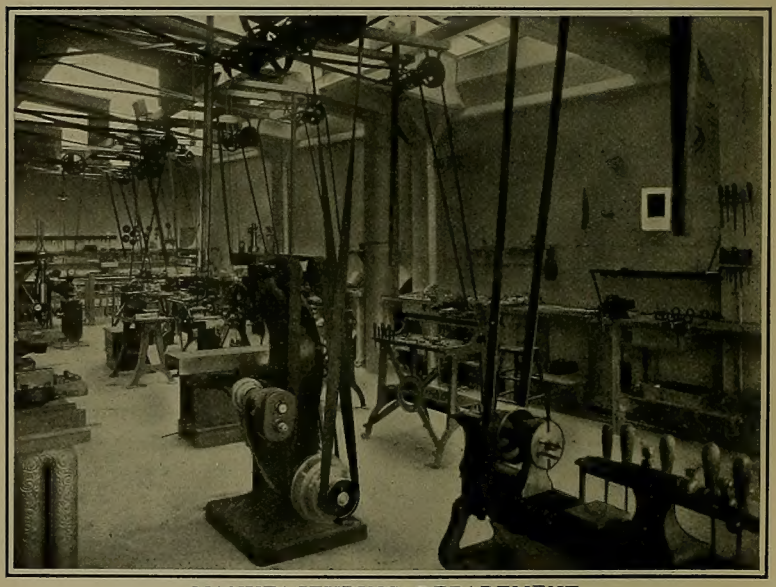
EXTERIOR OF THE A. LIETZ CO. SALESROOMS
61 Post Street, San Francisco, U. S. A.

INTERIOR VIEW OF THE A. LIETZ CO. SALESROOMS

THE NEW A. LIETZ CO. FACTORIES

Fifteen months after the San Francisco catastrophe of April 18, 1906. Entirely reinforced concrete, wired-glass windows, metal window frames, self-closing. Secures greatest stability for precision work. Annex constructed in 1918 to better facilitate the manufacture of nautical instruments for the U. S. Navy Department and U. S. Shipping Board.

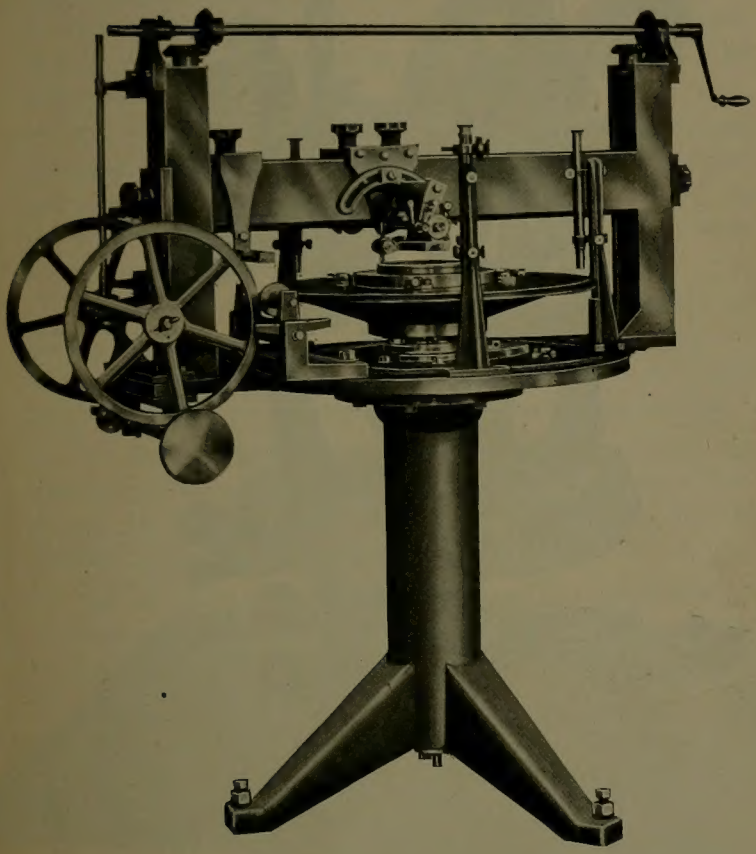
MANUFACTURING DEPARTMENT
Fourth Floor, West Side



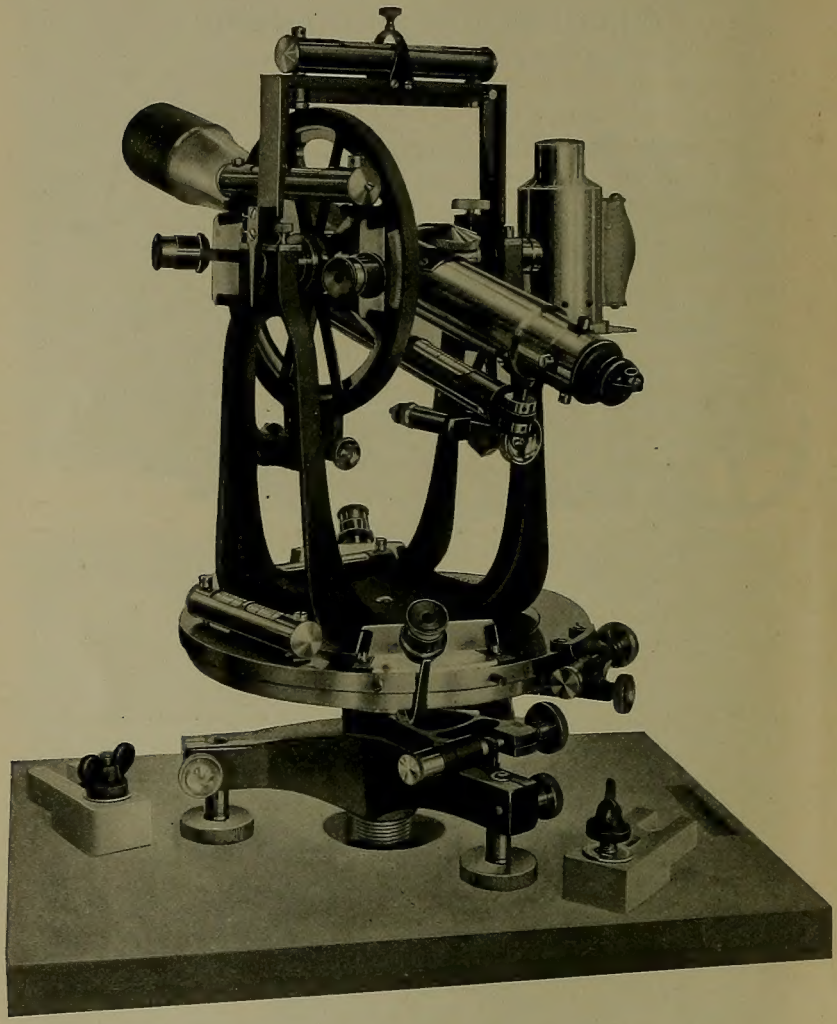
MANUFACTURING DEPARTMENT
Fourth Floor, East Side

CIRCULAR DIVIDING ENGINE

Built by A. Lietz Co. for the Graduating Department



We are in position to regraduate the arcs or circles of all makes of surveying instruments; also sextants, octants, protractors, etc. Prices on application.



LIETZ BOUNDARY PRECISION THEODOLITE

To order only

PREFACE

The articles manufactured by this Company are quoted at prices consistent with their quality of workmanship and material. We endeavor to place before the public the very best that can be produced or obtained, without imitating in shape or design the products of other makers. All our articles are of the most recent standard, with every known improvement.

The Lietz instruments are well known to the profession, having been made under the personal supervision of our Mr. Lietz since 1882; and with our new buildings and the latest improved machinery, designed to meet our peculiar methods of obtaining the highest results, we are producing goods of efficiency at most moderate prices.

It has always been our endeavor to produce articles of merit and for this reason we cannot contend that our goods are cheap. Likewise our line of equipment and supplies has been selected with due regard to their merit and the satisfaction to be obtained through their use.

We make a large variety of instruments, each of which is constructed with special regard to the class of work for which it is intended. Therefore we offer a full assortment from which the most exacting can feel assured of the highest satisfaction.

Our instruments are made primarily to use. Our guarantee means that they will wear many years if properly cared for, barring accidents, of course. Many of our earliest products are today doing service in the field.

We respectfully solicit a continuance of the esteemed patronage of our many friends and hope to merit it through consistent care and attention to the details of the demands which may be placed upon us.

THE A. LIETZ COMPANY.

NOTA

Este manual reemplaza las ediciones anteriores de nuestro catálogo y está cuidadosamente revisado y corregido a la fecha.

Al formar pedidos guiados por el catálogo, sírvanse mencionar el número, nombre y la medida del artículo. Al telegrafiar pedidos por instrumentos de agrimensura, usen palabras de clave, para comodidad.

Nuestros precios son F. O. B. San Francisco. Transportación de mercancías enviadas a vistas ó para su examen, es a cargo del cliente.

Sírvanse tener cuidado de mencionar el Distrito y Estado al dar su dirección, haciéndola en cada caso tan clara como sea posible.

No cobramos los empaques, con excepción de embarques para el extrangero que requieran cajas especiales y cuidado. Cuando no recibimos instrucciones especiales, usamos nuestro propio criterio acerca de la manera de embarcar y pagaremos anticipados los gastos de transportación si así se desea, agregando esas sumas a la factura.

Garantizamos todas las mercancías manufacturadas por nosotros, y cualesquier artículos que no resulten satisfactorios pueden devolvérsenos y nosotros los cambiaremos gustosos. Si no estuvieren satisfechos, sírvanse escribirnos.

Nuestra política es satisfacer a nuestros clientes, porque creemos que los clientes satisfechos son nuestro más alto caudal.

Compradores distantes se servirán remitir por cheque certificado, por express, ó giro postal ó por carta certificada, ó pedir los artículos C. O. D. pagaderos a su entrega.

De acuerdo con las reglas de Wells Fargo Express Company, un instrumento de agrimensura, cuidadosamente colocado en su caja y en una caja de empaque, es despachado como mercancía y se cobra "tarifa sencilla." Triple tarifa es aplicada si no se observa esa precaución. Por consiguiente, el cliente no deberá omitir conceder extricta atención a esta regla de la compañía de express, y evitarse cargos excesivos.

Cajas de empaque para instrumentos de agrimensura, son proporcionadas por nosotros a muy bajo costo.

THIS MANUAL WAS WRITTEN EXPRESSLY FOR THIS COMPANY AND THE MATTER THEREIN CONTAINED IS PROTECTED BY COPYRIGHT. PARTIES INFRINGING WILL BE PROSECUTED

ENTERED ACCORDING TO ACT OF CONGRESS IN THE YEAR 1910
BY
THE A. LIETZ COMPANY
IN THE OFFICE OF THE LIBRARIAN OF CONGRESS AT WASHINGTON

NOTICE

This manual supersedes the former editions of our catalogue and is carefully revised and corrected to date. Kindly destroy old issues.

When ordering from catalogue please give numbers, the name and size of article. When telegraphing orders for surveying instruments use code words for convenience. For code see Pages 66 and 67.

Our prices are F. O. B. San Francisco. Transportation on goods sent on memorandum, or for examination, is at the expense of the customer.

Please be careful to add the county and state to your address, making it, always, as clear as possible.

We make no charge for packing, except on foreign shipments requiring special cases and care. Unless otherwise ordered we shall use our best judgment in the way of shipping, and will prepay transportation if desired, adding amounts to your invoices.

We guarantee all goods sold by us, and any articles which do not prove satisfactory should be returned to us, and we will cheerfully rectify or replace. Kindly write if dissatisfied.

It is our policy to please our customers, believing that satisfied patrons are our highest asset.

Distant purchasers will please remit by certified check, express or postoffice money order, or registered letter, or order goods sent (C. O. D.) cash on delivery.

According to the rules of Wells, Fargo's Express Company a surveying instrument, carefully placed in its case and in a packing box, is shipped as merchandise and charged at "single rate." "Three rates" will be charged if this precaution be not taken. The customer should not omit, therefore, to pay strict attention to this rule of the express company and avoid unnecessary overcharges.

Packing boxes for surveying instruments are furnished by us at a nominal rate.

MAP SHOWING PARCEL POST ZONES FROM SAN FRANCISCO

PARCEL POST.

The postmaster, with the consent of the Interstate Commerce Commission, may at any time change the parcel post rates and conditions. Following are the rates which were in effect April 1, 1918.

Zone	Distance	First Pound	Additional Pounds	Weight Limit Lbs
	Local	$0 05	$ 01 @ 2 lbs	70
1	within 50 mi	.05	.01 " 1 lb.	70
2	50-150 "	.05	.01 " "	70
3	150-300 "	.06	.02 " "	50
4	300-600 "	.07	.04 " "	50
5	600-1000 mi	$0 08	$0 06 @ 1 lb.	50
6	1000-1400 "	.09	.08 " "	50
7	1400-1800 "	.11	.10 " "	50
8	1800 and over	.12	.12 " "	50

RESTRICTIONS.

Size limit, 84 inches in length and girth combined (total of length and around parcel).
Four ounces or less 1 cent per ounce or fraction, any distance.
Over four ounces considered one pound.
Fractional pounds considered pounds.

SPECIAL CONDITIONS.

Ordinary postage stamps, as well as special parcel post stamps, may now be used on parcels and all kinds of fourth-class matter.

Parcels will be mailable only at post offices, branch post offices, lettered and local names stations and such numbered stations as may be designated by the postmaster.

All parcels must bear the return card of the sender, otherwise they will not be accepted for mailing.

Fourth-class matter embraces that known as domestic parcel post mail, and includes merchandise, farm and factory products, seeds, cuttings, bulbs, roots, scions and plants, books (including catalogs), miscellaneous printed matter weighing more than four pounds, and all other mailable matter not embraced in the first, second and third classes. Classification excludes matter of a character perishable within a period reasonably required to transport and deliver, and parcels of form and kind likely to injure postal employes or equipment or other mail matter.

C. O. D.—Sender of parcel on which postage is fully prepaid may have price of article and charges thereon collected on payment of 10 cents additional in stamps affixed if the amount is not over $100. The "C. O. D." fee also covers insurance against loss, rifling and damage up to $50 actual value.

Fees and conditions.—Fourth-class or domestic parcel post mail (but no other) may be insured against loss upon payment of a fee of 5 cents for value not exceeding $25 or 10 cents for value not exceeding $50, or 25 cents for value not exceeding $100, in addition to the postage, both to be prepaid with stamps affixed. It may not be registered.

Such mail may be insured at any post office or station thereof, or by rural carriers. The sender must fill out an insurance tag, which will be furnished him on request, to be attached to the parcel.

Return Receipts for Insured Parcels may be obtained by indorsing the parcels "Return receipt desired."

On parcel post packages on which postage amounts to 25 cents or more, a War Tax of 1 cent for each 25 cents worth of postage or fraction thereof, is imposed.

MONEY ORDERS.

On and after July 1st, 1894, the fees for the issue of domestic Money Orders will be as follows:
For orders—Not exceeding $2.50, 3 cents.

Exceeding	$2 50	and not exceeding	$5 00, 5c	Exceeding	$40 00	and not exceeding	$50.00, 18c
"	$5.00	" " "	$10 00, 8c	"	$50.00	" " "	$60.00, 20c
"	$10.00	" " "	$20.00, 10c	"	$60.00	" " "	$75.00, 25c
"	$20.00	" " "	$30.00, 12c	"	$75.00	" " "	$100.00, 30c
"	$30.00	" " "	$40.00, 15c				

REGISTRATION.

All kinds of postal matter may be registered at the rate of ten cents for each package in addition to the regular rates of postage, to be fully prepaid by stamps. Each package must bear the name and address of the sender, and a receipt will be returned from the person to whom addressed.

An indemnity—not to exceed $25 for any one registered piece, or the actual value of the piece, if it is less than $25—shall be paid for the loss of first-class registered matter.

FREE DELIVERY.

The free delivery of mail matter at the residences of the people desiring it is required by law in every city of 50,000 or more population, and may be established at every place containing not less than 5,000 inhabitants.

FOREIGN POSTAGE.

The rates of postage to all foreign countries (except Canada, Cuba, Panama, Mexico, and Shanghai, domestic rates) and (Great Britain, Ireland and Germany, domestic rates for letters only) are as follows:

Letters, first ounce or less, 5 cents; each additional ounce, 3 cents. Postal cards, each 2 cents. Newspapers and other printed matter, per 2 ounces, 1 cent. Commercial papers (such as legal and insurance papers, deeds, bills of lading invoices, manuscript for publication, etc.), Packets not in excess of 10 ounces, 5 cents; Packets in excess of 10 ounces, for each 2 ounces or fraction thereof, 1 cent.

Samples of Merchandise, Packets not in excess of 4 ounces, 2 cents. Packets in excess of 4 ounces, for each two ounces or fraction thereof, 1 cent.

RATES OF POSTAGE.

POSTAL CARDS.—2 cents each, go without further charge to all parts of the United States and Canada. Cards for foreign countries (within the Postal Union) 2 cents each. The face of postal cards issued by the Post Office Department may be divided by a vertical line placed approximately one-third of the distance from the left end of the card; the space to the left of the line may be used for a message, etc., but the space to the right for the address only.

LETTERS.—To all parts of the United States, Canada, Mexico, Panama, Cuba, Ireland and Shanghai, China, Bahamas, Barbados, British Guiana, British Honduras, Dominican Republic, Dutch West Indies, England, Leeward Islands, Newfoundland, New Zealand, Scotland, Trinidad and Wales, 3 cents for each ounce or fraction thereof.

LOCAL, OR "DROP" LETTERS.—The rate on drop letters is 2 cents an ounce or fraction of an ounce. This applies to all letters (but not to other first-class matter) mailed for delivery within the postal district of the office where deposited, including delivery by the city, rural or other carriers of such office. The 2-cent drop-letter rate also applies to offices which have no free delivery service.

FIRST CLASS.—Letters and all other first-class matter, whether sealed or unsealed, and all other matter, sealed, nailed, sewed, or fastened in any manner so that it cannot be quickly examined, 3 cents for each ounce or fraction thereof.

SECOND CLASS.—Only for publishers and news agents, 1 cent per pound.

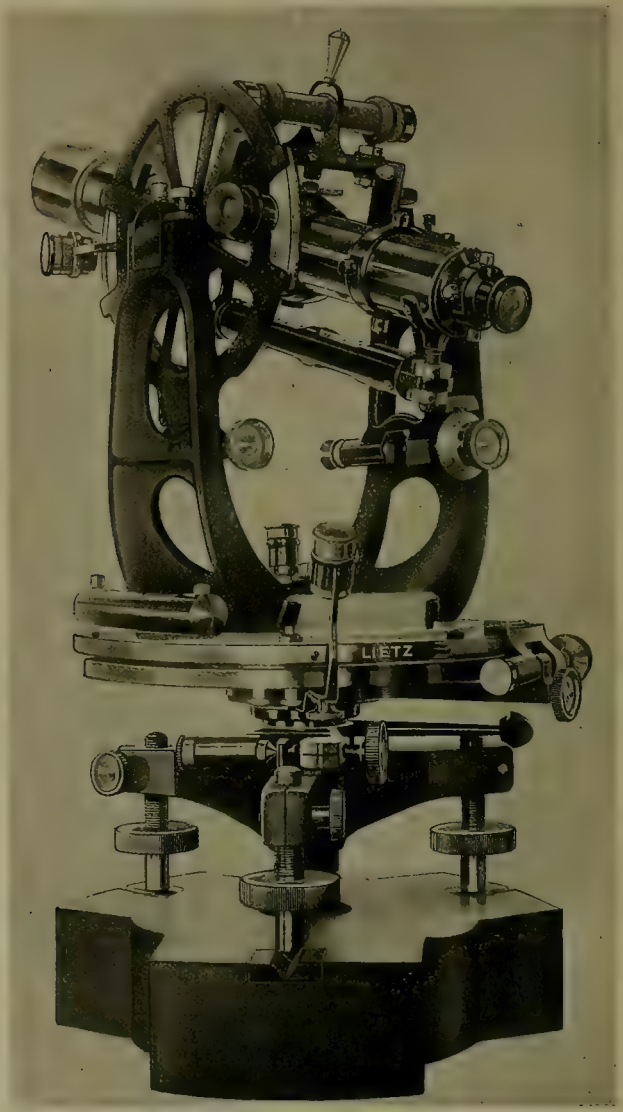
Newspapers and Periodicals (regular publications) can be mailed by the public at the rate of 1 cent for each 4 ounces or fraction thereof.

THIRD-CLASS MATTER.

THIRD-CLASS MATTER embraces circulars, newspapers and periodicals not admitted to the second-class, nor embraced in the term "book," miscellaneous printed matter on paper not having the nature of an actual personal correspondence, proof-sheets, corrected proof-sheets, and manuscript copy accompanying the same, and matter in point print or raised characters used by the blind. (Books are included in fourth-class or parcel post mail.)

TYPEWRITING AND CARBON AND LETTER-PRESS COPIES thereof are the equivalent of hand-writing and are classed as such in all cases. Matter produced by the photographic process (including blue prints), is printed matter. Matter printed on material other than paper is fourth-class.

CIRCULARS.—A circular is a printed letter sent in identical terms to several persons. It may bear a written, typewritten, or hand-stamped date, name and address of person addressed and of the sender, and corrections of mere typographical errors. When a name (except that of the addressee or sender).



Type of instrument approved by and made for the Bureau of Engineering of the city of San Francisco

DESCRIPTION OF

THE LIETZ INSTRUMENTS

INCLUDING REMARKS ON THEIR USE, HANDLING, CARE, PRESERVATION AND ADJUSTMENTS.

THE ENGINEERS' TRANSIT OR THEODOLITE

In reviewing the different parts of the transit and theodolite, it will answer our purpose to include them, for the present, under one head, using both terms as synonymous—the word theodolite having been defined as an instrument of angular measure, possessing two graduated circles, normal to each other, which during manipulation are set in horizontal and vertical planes respectively. Authorities say that it is generally believed that the word theodolite (theodolith) is a combination of θεα sight, οδος road, and λιθος stone and that in order to understand this derivation it must be known that formerly all supports upon which theodolites were placed were made of stone. This meaning, however, seems somewhat ambiguous, and other derivations have been sought. The etymology of the word is uncertain.

In classifying there appear two distinct groups of theodolites: the simple theodolite, in which the lower clamp and tangential movement is neglected; and the repeating theodolite, possessing the double horizontal movement on spindle and plate, which is the principal feature of all complete field instruments made for the engineer at the present time.

The various parts of the transit or theodolite may be grouped under the following heads, viz.:

Beginning from the base-plate we have:

1—The tripod connection with the leveling, plumbing and centering apparatus (Page 14);

2—The centers (Page 17);

3—The graduated plate and verniers (Page 17);

4—The compass and variation plate (Page 20);

5—The standards with the vertical arc and its movements (Page 22);

6—The gradienter (Page 23);

7—The spirit levels (Page 23);

8—The telescope (Page 24).

1. The Tripod Connection

An important feature of the Lietz precision-class instruments is that they are attached to the tripod by a *friction coupling.*

It has been customary to accomplish this, heretofore, in two different ways. One is to attach the instrument to the tripod by means of a screw at the base-plate, whereby it remains complete in all its parts and is never separated above the leveling screws. This is the method employed by the best makers, but it is somewhat tedious and unsafe, as every engineer has had occasion to find out. It is often the case that the screw will not catch, and there is always a loss of time and patience in trying to enter the thread properly. Another point is that while turning it on, the entire weight of the instrument rests upon the screw thread, with a constant tendency to wear it away.

The second method of fastening the transit to the tripod is by means of the center, making it attachable or detachable above the leveling screws. In most cases the foot screws may also be turned from the tripod head, but it is not unusual to have them remain as a fixed part of it. This mode of coupling seems to us very defective. The exposed center is liable to injury in many ways. Dust particles accumulate, and it moves with difficulty in consequence, if it does not cause fretting. But its greatest fault is the incumbent necessity of providing for it what is called the *flat center,* for turning the upper plate. In such an instrument the plates stand too high above the leveling screws, which causes unsteadiness. We believe it to be very difficult, if not impossible, to do accurate work with such an instrument.

These substantial reasons caused Mr. Lietz to invent the *tripod coupling,* which is regarded as the most successful innovation by all who have had occasion to use it.

Figure 1 fully illustrates this simple but most effectual device.

On the tripod head, instead of the ordinary screw, there are three jaws. The base-plate of the instrument is swallowtail-shaped on the inside (as shown at *F*), the head having a spring bolt *C**. The coupling of the two is done by letting one of the grooves on the base-plate meet any one of the jaws on the tripod head, when one-third of a revolution to the right will make the connection; at the same instant the spring *C* will fall into a hole in the base-plate, which thus prevents any possible disconnection; the latter is effected by lift-

* The spring C in the latest construction is now placed on the tripod head, between the lugs. See illustration, page 98.

ing the spring *C* and turning to the left. If the tripod head should have been worn or bent by accident, the movable jaw *D*, which is worked by the side-screw *E* (with a large adjusting pin), will again give the coupling friction enough to hold the instrument perfectly firm on the tripod.

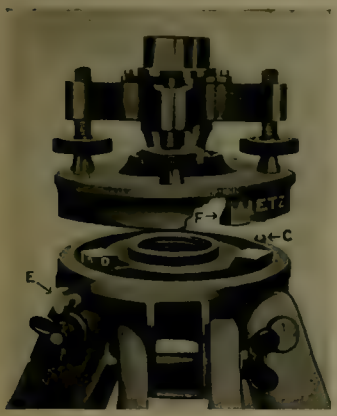


Figure 1
See, also, illustration on page 90.

LIETZ LEVELING HEAD
Quick leveling head attachment.
Price, extra, $20.00.

The chief merit of our arrangement is that it enables one to attach or detach the instrument to or from its tripod more rapidly, firmly and safely than by any other device so far known, and that, too, without dividing the instrument proper into two parts, which is always injurious to its accuracy and stability, as we have just pointed out. To this we may add that it is more durable, easier to keep clean and cannot get out of repair.

The movable jaw, once set for the instrument, need not again be interfered with. It is absolutely needless to adjust the friction every time the instrument is placed on the tripod.

We feel quite confident in saying that every engineer who has once used this new coupling will readily detect its great merits, and will never be without it. All the large-sized transits and levels of the Lietz make fit the same tripod head, and are instantly adjusted.

Leveling Screws

As these are used more than any other part of the instrument, it is evident that they should be very durable. Those of the Lietz

make possess a very deep thread, rounded a little on the edge, which insures a very smooth motion and greater durability than sharp-edged threads. The screws are made of composition metal.

The lower construction of the transit is made with the view of affording the greatest steadiness under all conditions. For that reason the leveling screws are not run through a thin metal disc, with a common nut attached for their operation, but an extra strong, star-shaped casting, made in one piece, is provided, through which the screws are passed and in which they operate.

The whole construction of this part is intended to insure the absolute steadiness of the instrument, and to give it rigidity even in a strong wind. Any other construction, with a light disc parallel to the base-plate, cannot afford that stability which a first-class transit or level should possess; and, since this is one of the prerequisites of an instrument of precision, we have laid particular stress upon our leveling arrangement, which is of the most approved modern design.

For instruments of the greatest precision, as those used in triangulation or geodetic work, it may be an advantage to arrange the base with three leveling screws instead of four. These changes will always be made upon application. While the ordinary complete transit is more compact and of greater utility with four screws, in a specially designed instrument for the finest work it will always be well to consider the advantages of the three-screw system, universally adopted in European instruments.

Shifting Center for Facilitating Plumbing and Centering.

All our complete instruments are furnished with shifting plates for the purpose of setting them precisely over a point, after having approximately done so by the tripod legs. This arrangement is of the greatest utility to the field man, and we are convinced that those who have adopted it will never again dispense with it.

While it does not make the instrument less rigid or portable, it is so easily manipulated, and becomes a great labor-saving factor. In order to center the instrument accurately, two of the leveling screws require a slight loosening, when the transit may be shifted upon the tripod until the center of the plumb-bob is directly over the point to be occupied. The screws are then turned down and the instrument leveled up in the usual manner, when it will stand as firm upon its base as required.

2. The Centers

In manufacturing this all-important feature, the very backbone of the instrument, too much care and attention cannot be bestowed.

It is essential that both of these metal axes should have the same absolute center as the graduated plate and the horizontal telescope axis, whichever way the instrument may be turned. This is accomplished by the A. Lietz Company by making this detail a specialty. The carefully chosen material for the vertical axes, the exact method of turning and fitting them, and the precision reached in the manner of centering them, together with the subsequent scrutinizing test to determine the slightest eccentricity, have accomplished results as perfect as mechanical means and human ingenuity can achieve.

Eccentricity has been a source of annoyance and error to the engineer, to determine which a number of practical methods have been invented and put to use.

But with our modern transit, if used with ordinary care, this source of error has been eliminated, or at least reduced to the lowest possible minimum.

The length of our centers is from 2¾ to 4 inches, according to size and style of instrument. To our best belief, this is more than the instruments of any of the many different makes possess, having constantly handled a great many of them in repairing. Yet, by examining our illustrations, it will be noticed that with us the limb and vernier plates are nearer to the tripod head than in those of other make, owing to the judicious placing of the centers, which reach down into the base, thus insuring the utmost stability. By comparing our cuts with those in other catalogues, the reader will obtain a pretty fair idea of what we mean to impress upon him—such a comparison being better than any argument by either ourselves or others, based upon mere assertion.

Examine carefully our construction of the centers, and you will be soon convinced that our claim for rigidity and stability is fully warranted.

3. The Graduated Plate

We have now come to the most essential part — the very soul of the instrument. It is needless to dwell upon the necessity of an accurate graduation; it is self-evident, and it becomes the instrument-maker's pride to make it so.

We guarantee our work in this particular as perfectly reliable, the graduation lines straight, thoroughly black and of uniform width.

The plate is accurately centered and free from eccentricity, as already explained. Illustrations shown on Pages 62 and 63.

The horizontal circle is graduated from 0 to 360 degrees, with two sets of figures running in opposite directions (unless ordered differently). They are large and distinct, and, to avoid errors in reading, the figures of these two sets, and those on their corresponding verniers, are inclined on opposing slants, thus indicating the direction in which the vernier should be read.

We recommend graduations on a solid *silver* ring, as that metal offers many advantages for the purpose—in fact, its great permanency and smoothness renders it the only satisfactory surface for fine graduations. However, they are made as the customer desires; but since the additional outlay for silver graduation is only $10, we seldom have any difficulty in impressing the purchaser with its advantages.

It is customary with us to graduate circles so that they may be read to single minutes or thirty seconds of arc. We make any degree of refinement called for, but our manufactured goods are always on hand in the two vernier divisions named.

The Vernier

This consists of a small sliding scale, movable upon a larger one, so graduated that n parts thereof shall include either $n + 1$, or $n - 1$ parts of the larger scale. The scale may be applied to either straight lines or arcs, and aids to determine the smaller divisions of measure between the lines on the larger scale. See illustrations Pages 62 and 63.

A tedious method for measuring small values of arc by means of concentric circles was given in the early part of the sixteenth century by a Portuguese, Pero Nuñez (Nonius), and after him the name of *nonius* is still applied in European countries to what we exclusively call a *vernier* here. This term was justly given it in honor of the Dutch captain, Peter Werner, who gave to the scale the sliding shape in which we now apply and use it practically. Signing himself "Pierre Vernier" in a discussion of the "Nonius," written by the inventor in the French language and published in Brussels in 1631, gave rise to the term we now almost universally employ.

The graduations on a vernier are usually so made that n divisions thereof shall equal $n - 1$ divisions on the circle.

It becomes a simple problem to determine the value of n from the following equation:

Let l = length of one division on circle,

l_1 = length of a vernier division, it is evident that

$l\ (n-1) = l_1\ n$, or

$$n = \frac{l}{l - l_1}.$$

The value of any quantity in the equation may then be readily expressed in terms of the other; $l - l_1$, or the smallest readable division, being equal to $\frac{l}{n}$.

It is customary to graduate the circles of the Lietz transits in 20-minute divisions, reading to either 20 or 30 seconds on the vernier. The value of n in these cases is $\frac{20 \times 60}{20}$; or 60 in the former, and $\frac{20 \times 60}{30}$, or 40 in the latter; or, in other words, 59 and 39 divisions on the circle will correspond to 60 and 40 on the vernier respectively. Instruments reading to one minute of arc are divided to 30 minutes on the plate; in that case 29 circle spaces are equal to 30 vernier spaces.

The verniers should be covered with glass to protect them from exposure, and for ease in reading they should be provided with ground glass shades.

Our verniers are in such position that the observer need not step aside in order to read them, for we place them about 30 degrees from the line of collimation. The method of thus placing them has been pronounced objectionable, because the size of the plate level, which is at right angles to the line of collimation, and the more important of the two, has to be reduced. By examining our instruments, however, any one will see that we have attained the object without reducing its length, without placing it over the vernier, and without allowing it to extend materially beyond the circumference of the plate — all of which would be objectionable features.

The space between the circle and the vernier must appear, through a magnifying glass, like a fine black line. No accurate reading can be taken if the space appears wider than a mere line of *uniform* thickness under the revolution of the plate.

Clamp and Tangent Screws

The lower clamp screw of our transit is of the best devised shape and arrangement. It is strong and rigid, and answers the slightest touch.

The upper clamp does not come in contact with the limb, but grasps the sleeve of the outside center. This is far preferable to the old method of pressing together the two plates by means of a screw placed at some point on the circumference.

The tangent screws are *single* only, and operate in metal cases against opposing springs. Great care has been bestowed in eliminating all lost motion of these screws. We consider double tangent screws, working against a tongue, as entirely obsolete. Any instrument sold today with double opposing tangent screws may be set down as antiquated and behind the times. It is absolutely necessary that everything tending to create lost motion must be carefully avoided. While adjusting the line of collimation, this source of error becomes very annoying, for, in revolving the telescope, the plate is liable to turn slightly and the operator is never sure whether the cross-hairs are in adjustment or not.

The arrangement of our tangent screws combine simplicity with absolute reliability. Being single, they require but one hand in manipulation, and their judicious location and spring case arrangement make them active and operative at any instant.

4. The Compass

Our needle differs somewhat in shape from others, being a little smaller in the center than towards the ends, for the reason that the magnetic influence is manifested at the ends only, so that all the central metal may be called dead weight. Compared with those of other makers, the Lietz needle is, therefore, a little lighter, which conditions the increased durability of the point upon which it poises.

Hard steel has the capacity of retaining magnetism longer and better than when tempered, and for that reason we have adopted the plan of leaving one-half inch on both ends perfectly hard.

The closest attention is given to the center cap — which contains an agate setting—and to the pin upon which the needle rests, for the accuracy or sensitiveness depends principally upon these two details. These needles possess that degree of sensitiveness required in a high-grade instrument. A sluggish needle—one that will hang like a dead load—is not fit for the observation of a reliable azimuth.

The center pin must occupy the true center of the graduated circle, and must stand normal to its plane. We utilize precise instruments with high magnifying power to obtain the absolute true position of the pin, in order to avoid all errors due to eccentricity.

The *lifting arrangement* is applied with the view of raising and lowering the needle gently and gradually, as any sudden drop to the pin, or any quick action of arresting its motion, is sure to cause a rapid wearing of the point and the cap.

The *Compass* is divided into 30-minute divisions, and numbered from 0 to 90 degrees in each quadrant from the north and south points. This is done to conform with the usual practice of surveyors in this country to record bearings in the four quadrants. But any desired method of numbering the compass, either from 0 to 180 degrees, or from 0 to 360 degrees, may be had upon application.

In order to record at once the true bearings in the field, instead of the magnetic, the instrument can be provided with a *variation plate, i. e.*, an arrangement for laying off the local deviation of the needle by a movement of the graduated compass ring, so that the indicated course of a line shall show at once its relation to the true meridian. It is so made that the variation may be laid off with precision to the minute, by the aid of the instrument's vernier.

This is done in the following manner:

Having set the plate vernier to zero, adjust the instrument and, with the aid of a good reading glass, place it in such a direction that the north end of the needle shall point to the zero of the compass ring, which latter must coincide with the little pointer provided for that purpose. Having carefully set the instrument thusly by means of the lower clamp and its tangent screw, which can certainly be done to the nearest minute of arc, we release the clamp of the plate and proceed to lay off the amount of the local deviation of the needle in degrees and minutes by means of the plate-vernier—to the right if the variation be east. The instrument is now again in a fixed position, the telescope pointing to the true north, or as much to the left of the needle as the magnetic variation is east. We now proceed to turn the ring until its zero shall coincide exactly with the north end of the needle, when every subsequent reading of the compass, in any position, will indicate the bearing of the vertical telescope axis from the true meridian.

This simple little device is fully up to the standard of accuracy required, for with care in setting the needle we can always obtain results correct within the nearest minute. We find that by this method the additional vernier, usually placed inside of the compass ring, becomes superfluous, as the plate and vernier of the transit are perfectly capable of taking care of the duties of this unnecessary accessory.

The variation plate has proven a great labor-saving device, as the observed courses require no reduction to the true meridian subsequently. It is now almost universally called for; and for those practitioners with whom land surveying is a specialty we should, by all means, recommend it as an indispensable feature.

5. The Standards and Vertical Arc

The standards are so constructed as to give the maximum support to the telescope, commensurate with the size of the plate. They are light, but rigid and strong.

To avoid unequal expansion of the metal in the standards by exposure in the hot sun, which has a tendency to elevate one end of the telescope axis and to depress the other, vitiating the adjustment, they are now what we call "Torchon" finished. This finish, being a non-conductor of heat, reduces to a minimum this source of possible error, which, in very sensitive instruments, is of sufficient moment to be guarded against. Other parts of our instruments are also finished in the same manner, particularly Level telescopes, which we shall have reason to mention again hereafter.

The bearings for the telescope axis are made with extra care and attention.

The axes of the Lietz transit telescopes are cut to conical or cylindrical bearings, which is a feature altogether preferable to the corrugated shape frequently found in surveying instruments. The advantage of the former is very evident, in that there is less friction than by any other contact; and, in addition to that, it affords a much finer fitting by reason of its shape. But it is *very essential* that the *hardest metal* should be used for this purpose, as a material of insufficient hardness would soon wear, and the axes would become elliptical.

One of the standards is supplied with an adjusting device to regulate any inaccuracy in the motion of the telescope in the true vertical plane, when the centers of the instrument stand vertically.

One standard carries the arc for observing vertical angles, which may be either a full or a half-circle, as the customer desires. It is usually made to read to minutes, but may be graduated finer if so ordered. A clamp and tangent screw are provided on the right-hand standard, which are made like those already described for the horizontal movement. Every part of the vertical measuring apparatus is strongly and accurately made and fitted, to insure the best results in its practical application.

6. The Gradienter

The head of the tangent screw of the vertical arc movement is made somewhat larger, properly silvered and graduated into a number of equal parts on its circumference, the thread of the screw being cut with great precision, so that its revolution may be accurately recorded by the divisions of the micrometer head. See illustration Page 65.

One complete revolution of the screw corresponds to $^{5}/_{10}$ of a foot of difference in level in 100 feet. Since the head is divided into fifty parts, it follows that one division equals a difference of $^{1}/_{100}$ of a foot in 100 feet. We can also furnish with a moveable head admitting a zero setting.

With this attachment grades may be established very quickly. It is only necessary to set the screw head to zero, level and clamp the telescope, and turn the screw up or down as many spaces as there are hundredths of a foot of rise or fall in one hundred feet of the grade to be laid out. With the small scale over the screw thrown back, the gradienter is used as an ordinary tangent screw. It is one of the most useful accessories, is easily applied, and adds nothing to the weight of the instrument.

This attachment is also useful in the determination of horizontal distances, it being obvious that the difference in rod reading between two complete revolutions of the screw will indicate at once the distance of the rod from the observer. Where the ground is level, or nearly so, the simple difference in rod reading will suffice; but when this is not the case, the necessary corrections will have to be applied to obtain the true horizontal distance.

7. The Spirit Levels

We have already noted that for our purposes we use the very best article obtainable.

An instrument of precision, capable of measuring delicate differences, requires delicate and sensitive levels. This is so obvious that we ought not to call attention to it here, were it not for the fact that we are frequently approached by surveyors who wish to impress upon us the idea that this or that make of instrument met with their approval because its bubbles would stay in place when once adjusted. For this reason we want to repeat that it is no claim for superiority of a spirit level because it works sluggishly. An engineer in the field must know when his instrument is absolutely level, and its bubbles should indicate to him at once when this is not the case. If they do not do so, then

the instrument does not come up to the required standard of a precise tool. It would hardly do to place a carpenter's level on a transit, yet we have no doubt that its excellent qualities of remaining stationary would find admirers.

There is, of course, a limit to the degree of sensitiveness, and that we never exceed, adapting it in all cases to the work demanded of the particular instrument in hand.

Our levels are ground to the proper curvature, and each is carefully tested upon our *level tester* before it is attached anywhere.

The telescope can be fitted with reversible level if desired.

8. The Telescope

We have now reached another most essential feature of the instrument—that which may be compared to the head of the body, containing the delicate organ of sight—the lens.

The Lenses

We have already called attention to the fact that our optical accessories are the finest made and that we take great pains to obtain the best article for the purpose.

Without going into the detail of optical mathematics and formulæ, that can be readily found in any text-book on physics, we all know that it has been the constant aim to produce lenses as free from spherical and chromatic aberration as it is possible to make them. The lenses of the Lietz telescopes are an achievement in theoretical and practical science of which it would be interesting to make some explanation had we the space to give to it.

The Eye-Piece

Two forms of eye-piece are known, the one giving the erect vision of the object, the other an inverted image. The latter admits of a greater amount of light and also allows a longer focal length to the object glass, thereby correcting spherical aberration besides increasing the magnifying power.

We have always considered this inverting form the more advantageous of the two; and we are convinced that if our engineers would accustom themselves to its use, it would finally be preferred; but we can appreciate the greater convenience of the erect form when the instrument is used by many men.

ILLUSTRATING PARTS OF LIETZ TRANSIT IN THE MAKING

The optical powers of the telescope are in perfect keeping with the accuracy of the centers, graduation and spirit levels, insuring a complete reliability and harmony in every part of the instrument for the most refined surveying work.

The eye-piece (always erect unless specially ordered) is so arranged as to permit its easy removal, if necessary, by simply unscrewing it. In replacing, it should always be well tightened up. It is movable in and out by a revolving motion, turning the cap about one-sixth of a revolution backward or forward, comprising the most practical and efficient method.

We shall now describe in a few words the mechanical construction of its other parts.

Other Parts of Telescope

The slide, to which the object is attached, fits directly in the outside or body of the tube. Particular attention is paid to this part to prevent even the slightest *shake,* and still procure an equal and sure motion, which is absolutely necessary, as no true adjustment of the line of collimation is possible otherwise. The motion is given by a spiral rack and pinion.

The sliding tube is protected from dust and dirt by an exterior metal cylinder, called the *slide protector.*

A *sun shade* is provided for the objective, which should always be attached, as the telescope, when focused to mean distance, is balanced with it; and a cap is provided for the protection of the objective when not in use.

The *cross-wire frame* is suspended in the tube by four capstan-headed-screws, by which it is adjusted, the frame being so constructed that the cross-wires cannot be torn, in case the adjusting screws are tightened too much.

The *spider web* used for our instruments is properly treated to avoid all twist, and to prevent its lengthening and becoming crooked in damp weather; it cannot become loose, as it is well secured.

For mining and tunnel transits we can provide proper means for *illuminating* the cross-wires—an arrangement that is readily supplied upon application.

Quite a number of *glass diaphragms* have been cut by us for the United States Coast and Geodetic Survey. Instead of the spider webs, a small disc of very thin glass is fastened to the diaphragm, on which fine lines have been drawn with a diamond. It is readily seen that

these cannot get out of shape, and for stadia measurements we think them of great advantage. The only drawback is that small particles of dust may settle on the glass disc, and, as they are in the focus of the eye-piece, they will be constantly visible to the observer.

We make no extra charge for putting these diaphragms into our new instruments, if ordered in time.

Stadia hairs are placed in our transits (and levels) when ordered. We have superior facilities for setting them with great precision to any desired ratio between distance and rod reading. It is customary to place them so that they shall read 1 foot on the rod for a distance of 100 feet, and to this measure we always have them in our stock on hand.

The stadia hairs may be *fixed* or *adjustable*. We advise the fixed, as they are less liable to change their distance. In an adjustable set the observer is never certain that the position of the wires has remained unchanged. We have constructed a delicate optical and mechanical apparatus for fixing stadia hairs accurately to any proportion; and by means of our powerful telescope, which has superior optical qualities, we can safely say that, with proper care and a little experience in that method of measuring, very satisfactory results may be obtained. The facilities for measuring across inaccessible places, and the speed with which it enables one to get distances, has brought this method into deserved prominence with our engineers. For topographical surveys it is indispensable.

When purchasing a new instrument, it is advisable to get one that has fixed stadia wires, which increases the cost only $3, while we charge $10 to put them into a transit or level sent to us subsequently.

In sighting with the telescope it is of considerable advantage to have it *reversible,* and our transits are made so as to allow this free revolution in a vertical plane. The telescope balances accurately when in focus to mean distance, the friction in the bearings being shaded to such a degree of nicety that it shall neither work too hard nor too loose—a feature which ought to have very close attention.

General Remarks About Telescopes

When selecting or examining an instrument, the engineer should be particularly careful to test the qualities of the telescope.

It should have sufficient magnifying power to correspond with the finer qualities of the graduation, axis, centers, spirit levels, etc., of the instrument. There can be no doubt that the excellencies of each detail must compare with that of any other.

Now, by using a low-power telescope, the *defects* of an *inferior instrument may be hidden, or left undiscoverable,* and for this reason they will always be found in articles of lower grade. Had such an instrument lenses of sufficient magnifying power, the defects would become apparent to the engineer at once. We lay the greatest importance upon these facts, and for this reason call particular attention to them. *Scrutinize the optical abilities of the telescope, and you will obtain the character of the whole instrument.*

An engineer should be careful to convince *himself* of the real magnifying power before making a purchase. He will find it much to his interest to do so.

We have found that the power of first-class instruments should be about twice as many diameters as the length of telescope expressed in inches. In inverting telescopes it may be materially increased, which shows again that they are of considerable importance in very high grade instruments.

In another place we have added a practical method for finding the magnifying power of a telescope, to which we would advise our engineers to give some attention, and to make use of when about to choose an instrument.

We have already pointed out the importance of perfectly centering the lenses, especially the objective. If this is not properly attended to, the adjustment can never be perfected for long and short distances.

We have heard many complaints of various makes about the change in adjustment, and after careful examination we have found that the adjustments remained intact, but that the fault lay in the objective, which had not been correctly centered. We take great pains to center our object glasses perfectly, and to insert the lenses in such a manner that if taken out they may be replaced in the old position, which is secured by a notch and a pin. It is not advisable for engineers, however, to take these lenses from the cell, as their cleaning may be effected without removing them.

Reverting again to the magnifying power of telescopes, it may be asserted that an increase thereof reduces the field. This is no defect, if the size of the latter is retained large enough to admit of stadia lines so placed as to read 1:100. We often leave the field much larger, however, in which case there appears just a slight dimness at the extreme border; this is unimportant, for it does not retract any of the virtues of the glass, and possesses, if anything, an advantage of finding an object more readily.

The quality of some of the telescopes of our best makers has often been questioned by competent engineers on account of a peculiar haze ascribed to the glass. This was found to be caused by a small film of moisture, which settles between the crown and the flint, and is not visible to the naked eye. We have been convinced, by advising with our optician, that the crown and flint glasses should always be connected with balsam. This does not decrease the amount of light, as formerly thought, but, on the contrary, it has advantages of clearness, in that it prevents foreign matter from settling between the lenses, which always destroys the image; the refrangibility, too, is under more favorable conditions in the balsam.

Extra Accessories for the Transit.

There are a number of additions made for transits used for special purposes, and these we keep on hand, and supply them when called for.

For *laying off right-angles,* for instance, we can make any provision, if the customer will order it in time. In fact, any of the accessories, not usual in the ordinary complete field instrument, will be made as an extra if our patrons will notify us.

For the *solar attachment* we provide a block with a thread on the telescope axis to receive these beautiful little apparatuses of which complete descriptions will be found later.

The Finish.

This is made to give the instrument an elegant, tasteful appearance, without adopting a color glaring to the eye. Our instruments are finished in an elegant leathered effect, but may be bronzed to the special taste of the purchaser, if he chooses to order it.

Size of Transit.

The dimensions and proportions of the several parts of the transit are given in Part II of this catalogue, where the different sizes and varieties of instruments made are described more in detail.

Packing.

This is not at all an unimportant feature. Our transit is easily taken from the tripod by means of the Lietz friction coupling already described, and set upon a wooden slide, to which it is fastened by means

of two thumb screws and wooden clutches—a manipulation requiring but a moment's time. Nothing is taken from the instrument except the shade—it remains a complete whole from the base-plate to the top of the telescope. The board slides into the box with the transit in an upright position, with the clamps secured to keep it from turning. An extra place is provided for the solar attachment, if there be one. The door may then be locked, and the instrument is absolutely safe, with the least effort of packing and adjusting in the box.

Rubber cushions are provided at the bottom of the case, to take up any sudden jar or jolt to which it may be exposed during transportation.

The Tripod.

We have adopted the new form of *split leg*—a construction which combines the greatest stiffness and strength with the least weight. The old form of the heavy solid leg has long since been abandoned, and we no longer make such a tripod, unless specially ordered by some conservative customer, or for very small instruments. We aim to reduce the weight of everything, without sacrificing steadiness or strength in any particular, and that the split leg meets these conditions better than the solid one must stand to reason.

The very best white ash is chosen and carefully worked. Instead of fitting the leg between two brass cheeks, we fit one cheek in the leg. In the older construction it frequently happened, in drawing the bolts closer to tighten a loose leg, that the cheeks would spring the plate, or weaken the screws that hold it. This is entirely obviated by the new arrangement of these parts, for the tightening can no longer affect the plate in the least. While in the former the leg would only fit at the lower part of the cheeks when drawn in by the bolt, it will always fit the whole surface of the cheek in the plan we follow, and after ten years' use it will be just as steady as when new.

The *shoes* are made on a gradual taper to a sharp point, and securely fastened to the leg. They are provided with a projection for pressing upon with the foot when setting up.

The large transit and the level fit the same tripod—in fact, any Lietz instrument may be readily fitted upon the tripod we manufacture, for the adjustment of the friction coupling allows a perfect accommodation to any slight variation in the parts of the base-plate.

LEVELING INSTRUMENTS

Lietz levels are manufactured in two different types, which we aim to keep constantly in stock, the *Y-level* and the *Dumpy level*.

In the manner of making these instruments, much that has been said of the transit will hold good here, and need not be repeated.

The three main qualities to be secured in a level are: *stability*, a *sensitive bubble* and a *powerful telescope*.

To secure the first, we need only refer to the solid construction of the star-shaped casting through which the leveling screws operate, already described in speaking of that feature in the transit. The Lietz coupling, too, plays an important part here, for we can make the tripod connection absolutely rigid.

The *center*, or spindle, is almost three and one-half inches long, and is continued through the clamp up to the bar, which enables us to bring the center of gravity as near as possible to the tripod head. Great care is exercised in fitting the center to the socket, and, being made of the hardest composition, it must be apparent that it is an utter impossibility to wear out these parts, even by fifty years' constant use. The liability of bending the spindle, so common an accident with instruments having soft centers, and the fretting of the same, also likely to happen at times, is altogether avoided.

The reasons for having a *sensitive bubble* have also been carefully set forth heretofore. Accurate work cannot be done with a sluggish bubble. No matter how much the virtues of the staying qualities may be extolled by some men, they are not fit for refined work if they do not answer the slightest touch of the leveling screw. If you can give a screw a twist or two before the bubble loses its peaceful equanimity, the work in hand would not be likely to inspire any great confidence.

Our level tube* is curved, so as to give for every two minutes of arc a one-inch motion of the bubble. A refined level of this character, however, will only do good service in an instrument having perfect steadiness and a powerful and sharply defining telescope. If placed in a level so constructed as to be topheavy, or in one whose center is frequently exposed by being a part of the tripod head—and therefore liable to collect dust both on the cone and in the socket, introducing sources of error after every detachment—then it will indeed prove very annoying, should an active bubble accompany such an instrument.

*Also furnished reversible for extreme accuracy. See Page 93.

These structural defects are probably the cause why many of our engineers are prejudiced against sensitive levels, and prefer a sluggish or dull one. We can only assure the reader again that a lively bubble, even if a little out of center by reversing the instrument, will still accomplish better results than an inactive one—one that gives the instrument an appearance of steadiness, which in reality it is far from possessing. An engineer only deceives himself if he trusts to a slowly acting level, which gives apparent satisfaction by concealing the errors that a sensitive one would soon indicate. A precision instrument never suffers by having its qualities exposed by a high-grade bubble.

The level *telescope* should have power and definition. It is hardly necessary to make that statement, after all that has been said on this subject in a previous chapter. It has been our earnest endeavor to obtain these results, without increasing the dimensions of the telescope and the other parts of the instrument, beyond the proper limits for steadiness and portability. A length of eighteen inches we have found to give the most advantageous results. Experience has shown us, that although an increased length adds to the magnifying power, it would only be of value if the other parts of the instrument were enlarged in proportion, which, on the other hand, would make it too heavy for convenience in carrying and offer more surface to the wind, thereby reducing steadiness, we believe that with our 18-inch level even the most extensive requirements in engineering are fully met.

Our new and improved eye-piece, and the use of an objective of proper proportioned diameter, enable us to obtain a magnifying power of 33. An increase of diameter adds very little to the weight of the telescope, and does not require a longer bar and larger plates, as an increase in length necessarily would, to retain steadiness. An aperture of 1⅜ inches, used to its full value, affords a high illumination with the above-mentioned power, as the tube is large enough to let all the rays proceeding from the object glass pass through to the field of view.

The diameter of the aperture of the object glass divided by the power, gives the diameter of the pencil of light entering the eye. In our telescope we obtain, therefore, $1\frac{3}{8} \div 33 = {}^{1}/_{24}$ of an inch, which shows that power and brightness are in accordance with optical law. To force the power beyond these limits we cannot conscientiously do, as that would be allowable only under certain circumstances—such as a perfectly clear atmosphere with a strong illumination of the object.

The *collars*, upon which the telescope rests in the Ys, are made of the hardest bell metal, and admit of a position in either direction, that is, the telescope is reversible. The very first requisite is that these collars must be of exactly *equal diameter* and *perfect cylinders*. If this be not the case, the line of collimation will not be parallel to a tangent of the bubble's curve at its highest point, when the latter indicates a horizontal position, and, for this reason, a true level cannot be obtained with such an instrument.

It is very often believed that in the course of adjusting the Y-level, by reversal of telescope and revolving on center, the bubble will indicate any inequality of the collars, but this is by no means true. If the Ys are both filed out to the same angle (this is generally the case, or at least very nearly so, as most makers file them out by means of gauges), the *inequality* of the collars may be quite appreciable, and yet the instrument will be adjustable in all its parts; in other words, it may be so adjusted that the bubble on all reversals in the Ys and revolutions on center, will always give the same reading at both ends, that is, indicate a true horizontal position. A final test is necessary, therefore, after the instrument is properly adjusted, to ascertain the equality of the collars. This will be mentioned further on under the head of adjustments.

Similar causes for error are introduced if a particle of sand lodges between the collar and Y, which illustrates the necessity of keeping these parts free from all dust and dirt.

It is readily demonstrated to what considerable difference any slight inequality in the diameters of the collars may give rise to, but the space here will not permit of a mathematical discussion of the subject.

We have carefully explained this defect, owing to the conviction on our part that it is a much more common one than is generally suspected. Numerous cases have come under our observation, where this fault existed in a remarkable degree. And in the perusal of many works on engineering and surveying, we have noticed very few that call attention to this material defect, and still less that give a correct test for it.

We are aware that accurate leveling may be done with a level out of adjustment, if the utmost precaution is taken to have equi-distant fore- and backsight. But looking at it from this point of view, why not use the dumpy level then, instead of the more costly Y-level?

The Finish is made to give the instrument an elegant appearance,

and yet obtain all the qualities alluded to in a previous discussion of the same subject. The telescope is "Torchon" *finished* to avoid that unequal expansion of the metal heretofore mentioned. This finish is of a color pleasing to the eye, is applied so that it remains intact for a long time, and if somewhat worn after a long period of exposure, it can be readily reapplied without difficulty at a trifling expenditure. This finish is a modern feature, and one that is so universally preferred, that we have no hesitation in recommending it to our patrons as worthy of their consideration. However, we also keep in stock the bronzed and lacquer finished level telescopes, so that the customer may have his choice in the matter.

The level telescope is supplied with a *slide protector* and with a *sunshade;* the latter should always be put on to balance it evenly. A cap is also provided for the objective and a shutter for the eye-lens.

In all other matters the transit details obtain here also.

Fixed stadia wires can be supplied, set to read 1:100, for which an extra charge is made if ordered, unless included in price stated.

The center movement is checked and regulated by a *clamp* and *tangent screw,* exactly similar to those of the transit.

Other useful accessories are attached, but any feature not usually found in the Y-level, must be ordered beforehand.

We are likewise in a position to make, but upon order only, *levels of precision* for the most exact work that the geodetic surveyor is called upon to perform. These are provided with all the delicate details that such an instrument must possess. We invite correspondence upon the subject of geodetic instruments, and will cheerfully furnish prices after consulting with our patron upon the nature and character of the instrument required.

The *packing* in the case has been made so as to assure safety in transportation, with the least trouble and inconvenience to the operator. The level is taken from the tripod by a third of a revolution of the base plate, which undoes the Lietz Coupling. It is let down to stand upright in the box, when the closing of the lid holds everything firmly in place. In all minor details the level box is similar to the transit case, every means being employed to insure absolute safety.

The Dumpy Level.

In this instrument the aim has been to construct it in such a manner that it shall be as compact as possible by dispensing with

certain features of the Y-level, not absolutely necessary in order to do good and reliable work.

The principles governing its construction are the same as those that obtain in the more elaborate Y-instrument.

The telescope is permanently held by two vertical arms attached to the level bar, and cannot be taken therefrom. The level tube rests upon these arms, over the telescope, and is also fixed. The telescope tube is thereby brought as close as possible to the tripod head, which is a desirable characteristic. All the other features remain the same as in the Y-level construction.

This instrument, which is almost exclusively used in Europe, has not yet met with that favor by American engineers, which its simplicity and accuracy so justly deserves. This is due partly to its greater inconvenience in adjusting as compared with the Y-level, and partly on account of defective construction, inferior telescope and other neglected details, which usually obtain in instruments of this kind.

We are confident that a dumpy level possessing a good telescope, sensitive bubble and stability, will do *just as good* work as the more costly Y-level. While the adjustment of the latter is made more readily, the former will *retain* it longer.

Our dumpy level has a bronze center, a 16-inch telescope, and a vial of such curvature, as to give for each inch of motion of the bubble an angle of three minutes.

There is no clamp or tangent screw to this form unless ordered by the customer.

The bar, telescope and vial case are "Torchon" finished, and the latter may be provided with a folding mirror, which acts as an important protection to the more exposed spirit level when shut down, or as an indicator to the observer at the eye-piece, of the exact position of the bubble, when elevated. See No. 20M, Page 101.

The stadia hairs may also be supplied to the dumpy level.

Other Levels on Sale.

In addition to the high grade instruments described, we also keep on hand a supply of smaller and less costly goods for leveling. With these instruments work may be done by the ditcher, irrigator, contractor, grader, farmer, dike-builder, gardener, plumber, architect, forester and military man, sufficiently precise for many ordinary purposes, wherein great accuracy is not required.

For a more detailed description of these instruments, see Part II of this catalogue, containing a price list of articles on sale.

REMARKS

In the foregoing we have endeavored to give the reader a fair idea of the principal engineering instruments made by this firm. We desire to convince our future customers—our old patrons we have long since convinced—that we are building conscientiously upon scientific principles, that every part and detail has been carefully studied to meet the requirements of our engineering fraternity, of the climate, and of all those conditions that influence the shape and character of every feature of the surveying instrument. It must permit of all operations at the least expenditure of time, it must be compact, it must be light, it must be absolutely accurate, it must be rigid, it must be stable and it must possess strength. And wherever a possible improvement is suggested in any detail, it must be applied at once and tested as to its probable merits, and if it prove of value, no time must be lost in introducing it. These are the principles that have governed the manufacture of the articles which we have brought to your notice.

New improvements have always had our attention, without any regard of the expenses incurred in experimenting. We need only refer to the introduction of aluminum in the manufacture of surveying instruments, which, we are fully convinced, has been crowned with success, to prove to our patrons that we never allow any conservative notion to rule the establishment. The particulars of this new field of manufacture will be found in another chapter of this part of the Manual.

With the object constantly in view to make only the very best article that can be produced, and ever ready to introduce improvements and to experiment with suggestions that may lead to them, our instruments are held at a price that is commensurate with their qualities. Their values are rated by those current among first-class instrument makers; they are *no more,* but they are *no less.* We do not handle cheap goods, and the trade that we are most anxious to please is that *willing to pay a fair price for a number-one article.*

It was our purpose to describe in this catalogue only the instruments for which there exists the greatest demand, and for this reason we do not intend, at this time, to enter into any detail of the manufacture of other scientific apparatus that we are in position to furnish upon due notice.

Theodolites of the highest grade for the most exact purpose, reading with micrometers to the most refined division, are made

upon order to any desired shape and design, and with every required accessory.

We also manufacture the topographer's *plane-table*, either in its simplest form, as recently perfected by the highest authorities, or in its most delicate arrangement of parts, as devised for work of the greatest precision capable of being put on paper. A number of plane-tables made for our institutions of learning, and for surveying departments of the U. S. Government, have given absolute satisfaction.

The modern improved plane-table alidade is a particular specialty, to which we have given considerable time and attention. This instrument has been constructed by us of aluminum, which has been a perfect success, proven by the fact that many have been almost daily in use for many years, under very trying conditions, without giving rise to the first complaint. Under the head of *Aluminum for Surveying Instruments*, this will be again referred to. By a combination of aluminum and aluminum bronze, the center of gravity of the alidade may be brought close to the foot of the standard, which is a very essential point in its construction.

ALUMINUM FOR SURVEYING INSTRUMENTS

A great deal has been said and written about this comparatively new metal of late, so that its characteristics have become generally known.

Its color is a dull white, similar to silver, and rather pleasing to the eye. It embodies many qualities that make it a very valuable material in the mechanic arts. It is quite soft, but possesses malleability, tenacity and ductility, so that it may be made into very thin sheets, or drawn out into fine wire. It is a conductor of heat and electricity. One of its principal features is that it does not oxydize in the atmosphere, and that it does not lose its brightness under conditions that would tarnish silver and blacken it, for sulphuretted hydrogen or sulphide of ammonium do not influence its color. But the greatest advantage is its remarkable light weight, the specific gravity being only 2.6, or one-fourth of that of silver, and for this particular quality its use has been sought in the manufacture of articles requiring small weight, ever since the cost of its production has justified it.

One of the many alloys is the so-called aluminum bronze, which unites hardness with malleability, and is therefore extensively used for many purposes. This alloy, however, gains little in lightness as compared with the ordinary metals.

Since it has been the constant aim to produce field instruments that shall combine strength with the least practical weight, there could not have been found a better application for aluminum than in the instrument-maker's art.

It was necessary to experiment with it in different directions, particularly as to the proper alloy—it being much too soft in its pure state—that shall give the required tensile strength and stiffness, make it workable without fretting, and yet add little to its weight. An alloy is now made that fully satisfies these conditions.

One of the principal objections urged against it in the manufacture of surveying instruments is, that on account of extreme lightness they would not be steady enough in the wind. This firm has built over 1000 transits and levels of aluminum, and, in our opinion, they are quite as rigid as any other, if properly constructed, care being taken to adhere to the old material in such details where it cannot be dispensed with. We have found that the stability of an instrument depends more particularly upon the construction of its lower parts. If the combination of base-plate and leveling apparatus be made so that the instrument can be rigidly held, the center of gravity may be brought down lower, and that in itself would tend to increase its stability.

Aluminum transits are made by the A. Lietz Company in three sizes, being complete field instruments with every accessory. The large transit weighs 10 pounds, and the smaller one 4½ pounds, which reduces the weight by 40%. The construction is precisely the same as in the instruments already described.

The base-plate is of composition metal, the inner center of the hardest bell metal, and the outer center of bronze. The leveling screws are also of composition, as well as the telescope axis.

These transits may either be left in the beautiful natural color of the metal, or other shades may be applied. The standards are "Torchon" finished.

The *Lietz Telescopic Solar Attachment is now made of aluminum*, which can only be an improvement in any direction, whether its weight be added to the top of a transit made of the red metal, or to one of the new metal. Lightness in the solar attachment is a very desirable feature, and that may be easily obtained now.

In the *Y-level* the base-plate and leveling screws and center are of composition metal; the collars, the hardest bell metal; and the rest, aluminum. It has an 18-inch telescope, its weight being 6½ pounds.

We also manufacture a *plane-table alidade* of aluminum, with a ruler of aluminum bronze. This instrument, although of the same weight as one of the ordinary metal of the same size, possesses the particular advantage of having its center of gravity as low as it can possibly be brought to the table, and that when placed upon the board it will be absolutely stable, and will not be influenced by the wind, which causes the ordinary alidade to tremble and travel on the paper.

And this is the reason why we should object very strongly to an aluminum rule in a plane-table alidade. This part of the alidade should be of heavy material, as well as the lower part of the standard, while the rest may be constructed as lightly as possible. In this case little or nothing may be gained in the weight, but very much is gained in stability, when compared with an instrument made of one metal throughout. Under no condition should the RULE, which is the BASE of the structure, be made of a light material.

Twenty-six years of experience in the construction of aluminum surveying instruments finds us ready to advocate the *judicious* use of this material. We have applied it in transits and levels, and have accomplished a saving in weight of about 40 per cent. Great care is exercised in the proper distribution of the metal. We have already stated that in a transit aluminum is never used in the construction of the base-plate, centers, leveling screws, telescope axes and all minor parts having threads. The principal horizontal members, the plates, are of aluminum, strongly ribbed.

Much has been written about its high coefficient of expansion, and particular stress has been laid upon the effect of unequal expansion necessarily induced by the use of different metals. If this matter be considered for one moment, however, it will soon be seen that practically there can be no serious result from this source. In the first place, the difference between the coefficients of brass and aluminum is altogether too small* that the effect of any possible distortion in material judiciously placed need necessarily be feared. Glass plays a very important part in the make-up of a transit. The coefficient of expansion in glass is very low (0.8 mm. per meter, raised 100° C) and a metal best adapted for our purpose would be one having the same coefficient. Now, as far as brass and aluminum are concerned, it is readily seen that there is practically no difference in them when compared with glass. As long as glass is used, one may as well employ aluminum as brass for the constructive parts, for while the

* Physical laboratories have established the following: For brass 1.88 mm. per meter of length, raised in temperature 100° C; for aluminum 2.34. Our deductions are made from these data.

expansion of the latter exceeds that of glass 0.000072 inches per linear foot for 1° Fahrenheit, that of the former does so only by 0.000103. Unequal expansion, therefore, is not a source of error that need reasonably be feared.

The more vital objection to a light instrument—its greater unsteadiness in the wind when compared with a heavier make—is something we have already referred to. We have made and sold over 1000 aluminum transits and levels, and every one has been a proof of our statement made twenty years ago: that the stability depends more upon the construction of its base and connection with the tripod than it does upon the weight of what may be called its superstructure—the part above the leveling head.

It may also be mentioned incidentally that a fall will injure an aluminum instrument less than if made of red metal. Not only is this theoretically correct, but our actual experience in this line has proven to us the fact that from ordinary accidents the lighter instruments are always less seriously injured than the heavier ones.

The testimonials from our customers will show the public that the aluminum instruments made by our firm have given the fullest satisfaction, and have not disappointed our expectations.

We are firmly convinced of the adaptability of aluminum for surveying instruments, and for that reason our firm has gone extensively into that branch of manufacture, for which every facility has been added recently to the capacities of the shop. The aluminum instrument is forty per cent. lighter than the other, is just as strong, is just as precise in its workings, possesses every requisite detail of a complete field instrument, and, *we claim,* is just as stable. Those of the engineering fraternity who have to carry the transit all day, the mining and railway men, who climb the mountain sides during the long summer days from early until dark, will not be long in finding out these advantages and in putting them to a severe test in every direction. After manufacturing aluminum instruments for twenty-six years we have had no occasion to regret it, and find constant encouragement from the best professional men.

CARE OF INSTRUMENTS

The greatest source of danger to a delicate instrument is *careless handling.* It is often subjected to violent usages for which there is absolutely no need. The rude way of manipulating its delicate parts; the unnecessary display of digital strength in operating a clamp; the useless strain applied to the leveling screws; the careless manner of

carrying it; the rough method of taking it out of its case, or replacing it; and the incautious closing of a lid or door of a box by force, before the instrument is somewhat adjusted to its position; all these are sources of danger that vitiate its adjustments and cause no end of trouble and expense. Although a well-made instrument is so designed as to stand many a shock without direct injury, any daily repeated abuse is sure to have its ill effect, from which your work must suffer.

As the usefulness of a transit or level may be preserved for many years by a little attention to details, we shall enumerate a few of the principal points which the engineer will do well to observe.

Always protect your instrument from rain by throwing over it a waterproof bag; and if it gets wet at all, clean it thoroughly after getting under shelter. It is not well to enter a hot room from the cold air, without giving it some protection. The condensing vapor settling on the metal and glasses is certain to give rise to injuries. It is always safe to place the instrument in its case before going into a warm room in winter. It is not well to leave your transit or level exposed for hours to the hot sun. Shade must be given either by a hood thrown over the instrument, or by an umbrella.

But accidents are liable to happen, and for that reason we have noted down a few remedies in case of an emergency.

The general tendency in the use of the screws is to overstrain them. This should never be done, especially with the cross-wire screws, which, when brought up too tight, are liable to constant change and loss of adjustment. The leveling and clamp screws, if over-strained, wear out sooner and may show fretting. If this takes place, they should be taken out and brushed with a little coal oil or benzine. The nuts are best cleaned by screwing a flat piece of soft wood through their apertures. In putting them together oil them slightly.

Fretting of the centers and of the telescope-slide will interfere more with a correct working of the instrument than any other part out of order. They should be watched, therefore, very closely, and as soon as any rough motion manifests itself, it should be remedied at once, if possible, by an instrument maker. If this cannot be had, and the fretting is in the slide, first scrape and then burnish down the place where it frets. It may also be ground slightly with oil and very fine pumice stone dust, which is best obtained by rubbing two pieces on each other. After grinding then a little, the tubes should be cleaned and placed together again with oil only; then move them in and out a number of times, wipe the oil off, and finally put them together

when dry. Should the fretting occur in the centers (if properly made and constructed, so that they do not come apart in detaching the instrument from the tripod, this will never happen), employ the same means; and if this be not effective, place a washer, made of paper or a thin card, between the shoulders. This will cause a shake, making accuracy impossible, and will introduce errors of parallax in reading off, which is better, however, than to destroy the centers wholly. The best unguent for them is very fine watch oil. Regarding *our centers,* we are fully prepared to *assure* our customers that *no fretting will ever happen,* as they are never exposed, and made with the utmost care.

The object-slide should not be oiled. Never, under any condition, use emery in trying to repair an instrument, as it cannot be removed again and will grind continually.

An efficient lubricant for leveling screws, clamps, pinions, etc., is well-rendered marrow.

If an instrument is upset, thereby bending centers and plates, do not turn it unnecessarily, as this will disfigure the graduation, but send it to a competent instrument maker immediately. There should be no delay in repairing defects.

In the matter of the tripod, it is wise to look to the screws that hold the legs frequently, and to keep them well tightened up; and to inspect the shoes, to see that they do not come loose. An instrument cannot be steady if there is any shake in the tripod, which is its support and must be firm in every particular.

The graduation is a very delicate detail to handle, and should be approached only with the utmost care. It is safe to leave this part to the instrument maker, and not to attempt to remove the plates, as they cannot be properly recentered without the aid of a testing apparatus. An exposed graduation may be cleaned with a little watch oil and a chamois skin, taking care not to touch the edges while this is done.

To preserve the sensitiveness of the *needle,* the center pin must be prevented from becoming dull. The instrument should never be lifted without raising and arresting the needle, and if, upon letting it down again, the swing is too large, gently stop it when within a few degrees of its natural bearing. Every check and start must be made gently, never abruptly. Should the point become dull, it is best to send it to an instrument maker; if this be not practicable, a watchmaker may perhaps attend to it. It should be remembered, however,

that the point of poise must be centered—that is, occupy the center of the graduated circle. This cannot be done by a watchmaker, and is only to be relied upon if made in an instrument maker's shop.

If a needle is made of good steel, well hardened and properly charged, it will not often lose its magnetism; and if, when placed away, it is always brought to line in the meridian, it will retain, or even increase is polarity. If a needle has lost its magnetism it may be charged again with an ordinary horseshoe magnet; one of three inches in length will be suitable for this purpose. The operation is this: hold the magnet with the poles upward, then, with a gentle pressure, pass each pole of the needle from center to extremity over the opposite pole of the magnet, describing before each pass a circle with a diameter of about double the length of the needle, taking care not to return it in a path near the pole. If the magnet is strong enough, the needle need not be taken out at all, but by raising it against the glass and then passing the magnet over this, it will be charged sufficiently. After charging, the needle has lost its balance, which may be easily restored by shifting the balance wire on the south end.

The observer should always satisfy himself that there be nothing about his clothing, especially in the make of the buttons, that would have any influence upon the needle.

In the matter of the telescope, intelligent handling will do much towards preserving its accuracy and reliability for a long time. In cleaning any of the lenses, use a soft rag or chamois leather. If the glasses should become greasy, or very dirty, wash them with alcohol. The inner faces will seldom require cleaning, and it is not advisable to take the telescope apart too often, as it is likely to destroy its adjustment. If dust should settle on the cross-hairs, it is safest not to touch them. The only remedy that may be tried is to take out both the object-glass and the eye-piece, and to blow gently through the tube. This may remove the dust without injuring the threads, but it is quite a delicate operation.

Cross-hairs may be replaced in the field by the engineer. The spider web is cleansed from dirt by placing it in water for a few minutes. A little manipulation readily removes any particle that may adhere to the thread. After drying for a moment, adjust it to the diaphragm, previously cleaned from dust, and attach it by means of a little shellac. It requires considerable practice to do this nicely, for a spider's web, although quite strong, cannot be handled by clumsy fingers without parting; but in the case of an emergency the engineer must try to do the best under all circumstances.

Referring again to the lenses, it is well to remember that in taking them apart, the centering is disturbed, and the engineer is not able to replace them properly, especially if they fit loosely in the cell, which is very often the case. The staining of flint-glass lenses is caused by the corrosion of the oxide of lead contained in the glass. This will generally occur when the lens is kept in a damp place for some time. In cleaning an object-glass, care should be taken not to rub it any more than necessary. Brush off the dust first with a camel-hair brush, and then wipe it carefully with a clean piece of chamois leather. If very dirty, wash it with alcohol or water and soft chalk, being careful to have the latter free from grit.

Considering that, in cleaning, each rub will destroy more or less of the fine finish of the lens, upon which depends the brightness and brilliancy of the image, the surveyor will be well repaid for his care in this particular.

Similar attention must be bestowed upon the *eye-piece*. With our high power eye-pieces, a motion of only three-sixteenths of an inch is necessary to allow for difference in eyes. As the sliding motion is for this purpose alone, it is not at all necessary to disturb it after it has once been properly adjusted, as long as *the same* person is using the instrument; even in packing it away in the case the eye-piece may be left so, as this extra extension is allowed for in the box. The cap is provided with a slide to protect the eye-lens from dust while the instrument is not in use; the engineer should never neglect to close this, and to cover the object-glass with its cap as well, as soon as the instrument is set at rest.

Repairs.*

We are fully prepared to make careful repairs to all instruments, from the graduation of an arc or circle, and the straightening of a center or plate, to the setting of a simple screw. In this particular branch we have operated here for the last thirty-odd years, and have gained the fullest confidence of our people. We need only state here that we guarantee satisfaction to our customers in every way.

As we are located in California, separated by the breadth of the continent from our Eastern colleagues, we are necessarily required to repair instruments of almost every known make, and this has compelled us to procure the various requisites in the workshop for all

* Experience has taught us that it is not wise to allow an ordinary mechanic to attempt instrumental repairs, as frequently resorted to in inland towns. It is always the case that this proves ruinous to the instrument, and subsequent repairs will be more extensive and expensive than if it had been shipped to the instrument-maker at once. Express charges are of far less importance, and may be made very reasonable. See notice in front of this manual.

emergencies. Today we are in the position to renew any part of an instrument, no matter where it was originally manufactured. Time and money will be saved by sending directly to us, and we shall try to give our customers every satisfaction. Whatever is entrusted to us will be thoroughly overhauled and put in the best possible condition, unless specified orders are received to confine the repairs to certain details. As a general thing it ought to be left to our judgment as to what the instrument requires; it may cost a little more if you follow our advice in this particular, but it will certainly be more satisfactory in the end. It will save time, trouble and additional expense. In the course of our examination of an instrument needing repairs, we discover defects that could not be apparent to any one before its parts were separated and individually tested. What may appear of no consequence, and is therefore neglected, is quite likely to lead to all sorts of subsequent inaccuracies in your work. Years of experience in this particular line have taught us the advisability of urging this point upon our patrons.

Considerable correspondence is had from inquiries about the cost of repairs. Although it is impossible to state the exact figures before an examination, there are certain rates for ordinary repairing that we may mention here.

The most expensive instrument in this regard is the transit, being the most complicated in parts. If injured by a fall, new centers and a new telescope axis is generally required, the cost varying from $10 to $50, reaching, sometimes, much higher. If slightly injured it will vary from $5 to $15.

Injuries sustained by leveling instruments are generally less serious. A new level vial costs from $2 to $7.50, according to size and sensitiveness. Instruments defective in construction or workmanship will not require a sensitive level, as that would be a source of constant annoyance to the engineer; the bubble should be chosen to harmonize with the general qualities. As a rule, we attach to the better class of instrument a level that shall give for each inch of motion of the bubble an angle of two minutes; to the inferior grade, one of three or four minutes.

Compasses sent to us are generally injured by the dulling of the center pin. Sometimes the plates and sights are bent and the glass broken. Often the center cap is worn out, and a new one is required. The cost of repairing ranges from $2 to $8, and even as high as $10. A new needle, having the largest breadth in a vertical direction, which

is far superior to the flat style, costs $5. A new center pin, 75 cents. New center cap with jewel, $1.50.

Careful readjustments made under the collimators are charged for at the rate of $2.50 for each instrument.

Transits and levels should always be accompanied by the leveling plates; the tripod and head need not be sent. With compasses the ball spindle should be sent.

We advise our customers to pack their instruments carefully, when sending them to us for repairs, as they are liable to material injury if this precaution be neglected. The space in the box between the different parts—of the transit particularly—may be filled with soft paper wads to protect it from jars and blows. It is well to put the case in an additional box, a little larger in dimensions, in such a manner that the top of the case is plainly visible and its leather strap handy for carrying. The space between the case and the box may be padded with shavings, or some soft material to take up the shocks. Mark upon the top of the box in large legible letters:

: ☞ THIS SIDE UP ! ! :
: SCIENTIFIC INSTRUMENT, :
: *Handle With Care ! !* :

And ship through a responsible express company, plainly addressed to:

THE A. LIETZ CO.,
632-648 COMMERCIAL STREET,
San Francisco, Cal.

The name of the *sender* and *his address,* together with the *value of the instrument,* should also appear on the box.

This will insure comparative safety in transportation, which is a point that should be well observed by the engineer. And this precaution would also increase the responsibiliy of the carrier, in case the instrument had suffered during transportation.

When an instrument is sent to us for repairs, a letter or postal card should be mailed at the same time, to inform us of the fact, giving the necessary directions, and stating when the return is required. The receipt of the instrument will be acknowledged by us at once.

Kindly address all correspondence to salesroom, 61 Post Street.

ADJUSTMENTS

Adjusting an instrument consists in delicately moving to the right or left, and up or down, certain parts that must be either parallel or at right-angles to each other. This is done by slightly turning a number of capstan-headed screws or nuts by means of a small steel rod, called an adjusting pin. Adjusting the vernier and compass consists in placing certain points in a straight line; but as these corrections are always made by the instrument maker, they do not properly apply to the subject before us. Verniers, limb and needle, if properly placed at the outstart, will not need any correction in the ordinary use.

Of the Transit.

1. Adjustment for Parallax.—This is a very essential one, and must be looked to carefully in every surveying instrument, whether transit, level or theodolite. It consists in so focusing the eye-piece that the cross-hairs shall stand out distinctly and well-defined, when the telescope is directed upon an object in focus. If this is not properly done the hairs will be dim; they will appear to travel and to seem unsteady when set on a mark. We know that this has given considerable vexation to the observer, and instruments have been disparagingly condemned for their apparent parallax, when nothing more was necessary than a slight movement of the eye-tube to focus the hairs properly. This fact should be well borne in mind. Our eye-pieces are quite easily moved in or out by a revolving motion, which affords a very fine and precise adjustment to focus.

Operation.—Direct the telescope so as to have a clear view of the sky, and then turn the eye-tube by the cap as just described, until the cross-hairs stand out like two sharp and distinctly drawn black lines. After a few trials this is accomplished without difficulty. Then try the telescope upon some object brought into focus and test the clearness of the wires. A point now bisected must stay so while the eye is moved laterally in front of the eye-hole. If it remains stationary, there is no parallax and the adjustment is made. Once properly set, the eye-piece may remain for the same observer for all time, and need not be adjusted from day to day. Attention has already been called to this point in a previous chapter, where it was noted that the instrument box was made large enough to allow the eye-piece to extend beyond the tube. (The sun-shade should be put on the telescope first, and then focused to mean distance to balance it properly.)

2. Plate Levels.—The object is to set the levels at right-angles

to the vertical axis of the instrument, so that when the bubbles are centered the axis is truly vertical.

Operation.—Bring the bubbles to the middle of the tube by means of the leveling screws, then turn the instrument on its center 180 degrees. If they remain central for any position, they are in adjustment; if not, they must be elevated or depressed at one end to correct them. One-half of the required correction is made with the capstan-headed screws on the vial case, the rest by the leveling screws of the instrument. Several repetitions of the operation may be required before attaining accuracy. It is well to have the plate in such a position, that the levels shall be parallel to a pair of opposing foot screws. If they are out considerably, it is better to adjust one first, approximately, and then the other.

3. THE STANDARD BEARINGS.—The telescope should revolve in a vertical plane when the instrument is level. One end of the telescope axis must be either raised or lowered until accuracy is reached. A capstan-headed screw is attached for that purpose.

Operation.—Set the instrument up within about fifty feet of the wall of a house. Take a well-defined point as high up as possible on the wall; clamp and bisect; then turn down the telescope and put a point in line as low on the wall as may be conveniently reached. Reverse the telescope and direct again to the upper mark, if you please; clamp and bisect; turn down to the lower mark, and if it is bisected, the telescope revolves in a vertical plane and requires no adjustment. If it does not strike the point absolutely, one-half of the difference is taken up by the capstan-headed screw, and the adjustment is done. Several repetitions of the operation may be required. It is not necessary to level the instrument, but it should be brought in such a position as to admit the bisecting of two well-defined points. Care should be taken, however, that the observation is made at the intersection of the cross-wires, and that the instrument is securely clamped.

This adjustment should always be made before that of the cross-wires, for this reason: that unless points of equal height are taken in the subsequent adjustment of the vertical hair, it will only then prove correct, if the telescope revolves in a truly vertical plane. It is, therefore, always better to look to this before the cross-hairs are adjusted.

This adjustment may also be made by means of an accurate striding level, such as manufactured by this Company for use in high-grade instruments. The transit must be precisely leveled up by the foot-screws and plate bubbles, after which the striding level is placed across

the telescope, resting upon its axis. It is evident that the bubble will indicate any deficiency in the horizontal parallelism of this axis, and, therefore, any error in the true vertical motion of the telescope, which may be corrected until the bubble of the striding level remains centered.

4. The Cross-wires.—The line of collimation should be at right-angles to the axis upon which the telescope revolves.

Assuming that all the required conditions have been fulfilled by the instrument maker—having placed the telescope in the center of the instrument, and having the tubes perfectly straight and normal to the telescope axis, which are necessary instrumental requirements, there are two methods that may be employed. One is by means of back and fore-sights, which is that generally used; the other consists of a test by means of three points in a range, where the middle one is occupied. Preceding either method the hair should be made truly vertical, so that either the upper or lower end will bisect a point when the telescope is moved up and down. This is easily done by loosening the diaphragm and turning it slightly in the required direction. To accomplish this the instrument must be leveled up.

Operation, First Method.—Occupying a point, direct the telescope to some well-defined mark, about four hundred or five hundred feet distant; clamp and bisect it; then revolve the telescope and place a point in the opposite direction at about the same distance. Now unclamp and turn the instrument half-way around; set the hair again on the first point, revolve the telescope and sight to the second point. If the intersection bisects the latter, the vertical hair is in adjustment. If not, the error can be corrected by the capstan-headed screws, which afford a lateral motion of the diaphragm. With them the vertical thread should be moved one-fourth of the space intercepted between the direction of the telescope and the direction of the second point. Several repetitions may be necessary to obtain accuracy.

The reason why only one-fourth of the space should be corrected for, becomes evident from the fact that in the first revolution of the telescope the error of the hair is doubled; and after reversing the instrument and revolving the second time, it is again doubled, but on the opposite side, so that the true direction lies exactly half way between the two, and to correct for it we must move the hair one-half the space between the true line and one of the points.

It is not necessary to level the instrument in order to make this adjustment; but in case it is not leveled up, the observations must be made exactly at the intersection of the cross-wires.

It must be remembered that the image at the cross-hairs is inverted, and that in consequence the screws must be moved in apparently wrong directions.

If there is any lost motion in the tangent screw, great care should be exercised in handling the telescope, so as not to influence its alignment.

Operation, Second Method.—Locate with the telescope three points in one direction, which are necessarily in a straight line, as long as the vertical movement of the telescope is in adjustment. Occupy the middle point with precision, and bisect one of the end points; revolve the telescope and sight at the other end point. If this is bisected, the instrument is in adjustment; if not, correct for it by taking up one-half the error. This method requires leveling of the instrument.

Thus far we have been speaking of the vertical hair only, as it is the more important in a transit telescope. In a plain transit—that is, one without a telescope level and without a vertical arc—the horizontal thread simply serves to define the middle of the vertical one, so that the observation may always be confined to a particular *point* in the latter. But if a level is attached to the telescope, then the horizontal hair should be brought into the optical axis, before the level is set parallel to the line of collimation; otherwise, though adjusted for long distances, it will fail to be correct for short sights.

Operation.—Set up the instrument near a house or fence and level up carefully. Clamp the telescope, and by means of its tangent screw bisect a point several hundred feet distant; then turn on center and mark a point on the house or fence, about ten feet distant. Now unclamp telescope, reverse it, revolve on center, and again bisect the nearest point. Turn instrument on center and see whether the hair intersects the further point. If it does not, the correction must be made, by lifting or lowering the diaphragm by means of the upper and lower capstan-headed screws, until the bisections, after repeated trials, will coincide.

5. The Telescope Level.—The object of this adjustment is to make the level parallel with the line of collimation. The principle underlying the method is: that points taken with the same angle of elevation or depression, and equally distant from the instrument, are of equal height.

Operation.—Set up on a nearly flat surface and level carefully. On opposite sides, at *equal* distances, drive two stakes giving the *same*

level-rod reading, with the telescope bubble centered in each instance. These points are necessarily on a level with each other. Now move the instrument to a point in line with both, and about ten feet distant from one. Level up again. Take a rod reading on the nearer and then on the further stake. If they agree, the level is in adjustment; if not, move the telescope with its tangent screw over nearly the whole error, and sight again at the nearer stake and then at the further, repeating this until the readings are the same on both, when the telescope is truly horizontal. Now bring the bubble in the center of the tube by the correcting screws of the level, and the adjustment is completed.

This adjustment may also be made in a room with the aid of a surveyor's level, with absolute accuracy.

Operation.—A few feet (one or more) from each other set up the transit and level, each directed to the other. The cross-hairs of the level must be illuminated by a light, so that they shall become plainly and clearly visible through the transit. For this purpose cover the eye-end of the level with a bit of white paper and place a lamp behind it. Focusing both instruments properly will make the hairs appear very distinctly. Now, if both instruments are properly collimated, the level carefully leveled up, and the transit telescope of such height that we may view the interior of the level's tube, we are ready to adjust the transit telescope to a level plane, which is done by simply placing the intersection of its cross-hairs delicately over the intersection of the level's cross-hairs. All that is required after that, is to center the transit's level bubble by means of the proper adjusting screws.

This method recommends itself on account of its extreme simplicity.

6. Zero of Vertical Arc.—This adjustment, once made by the instrument maker, is seldom vitiated. The object is to have the zero line of the circle agree with the zero mark of its vernier, when the level of the telescope indicates a horizontal position, and when the centers of the instrument are truly vertical.

Operation.—The instrument must be carefully leveled by the small plate bubbles, and then the telescope by means of its level. This accurately accomplished, the vernier is shifted until the zero lines coincide. This must be carefully done, so that the instrument is not disturbed, and, when the vernier is fastened, care must be taken to allow a space that shall neither be too small nor too great between it and the vertical circle. In the first case it would bind under certain

conditions of temperature, and in the latter the observer would not be able to obtain an accurate reading. The coincidence of the zero-lines must be made with a magnifying glass, and all parallax avoided.

7. Centering the Field of View.—On some transit telescopes there will be found another set of four capstan-headed screws, exactly alike to that which regulates the cross-hair diaphragm, and placed in a position quite close to it. These screws are for the purpose of directing the tube of the eye-piece in such a manner that the field of view may be divided by the cross-wires into four uniform quadrants; that is, they enable the operator to so adjust his field that it may be bisected horizontally and vertically by the threads. In the Lietz transits this adjustment has been omitted, for the reason that the tubes are made of such length and with such care—being absolutely straight—that there is no need of displacing the field, after the line of collimation has been made to agree with the optical center, and the hairs are properly adjusted. The lines can never appear noticeably out of the field in our transits, and any additional movement in the parts of the telescope would neither be useful nor desirable. A first-class transit instrument can dispense with this arrangement altogether, and for this reason it is not usually found there. With an extra long telescope, however, there would be a slight advantage in being able to direct the field of view, for a possible fall of the instrument may so injure the tube that it could not be made absolutely straight again afterwards, and in consideration of this, we have adopted this correction only in the case of the 18-inch Y-level, which is the most liable to be damaged in that way. It alone possesses two sets of capstan-headed screws near the eye-end of the telescope—one for the adjustment of the cross-hairs, and the other for shifting the field of view so that it shall appear equally divided by them.

Of the Y-Level.

There are three principal adjustments. The spirit level must be parallel to the axis of collimation; it must be at right-angles to the vertical axis of the instrument; the axis of collimation must agree with the optical axis.

There are other instrumental requirements which belong to the instrument maker, however, and it is with the above three adjustments only that the surveyor has to deal, as they are likely to become disturbed in time.

Before examining the adjustments, the sun-shade should be placed on the telescope, as it is only accurately in balance with this.

1ST ADJUSTMENT.—To set the spirit level parallel to the line of collimation, and, at the same time, place its axis in a plane with that of the telescope. It is best to attend to the latter first.

Operation.—Turn the telescope so as to stand over two opposing foot-screws, clamp the instrument and bring the bubble to the center of the tube; then rotate the telescope in its Ys, so as to put the level considerably out of a vertical—say about 15 or 20 degrees. If the bubble changes its position, it shows that the axis is not in a plane with that of the telescope. Correct it by moving the two side screws of the level case, until one-half of the deviation has been taken up. A few repetitions will insure accuracy, and destroy the side motion of the level.

The level must now be made parallel with the line of the bottom of the collars.

Operation.—Bring the bubble to the center of the tube; then reverse the telescope in the Ys end for end; do this carefully. The displacement of the bubble, if there be any, is the double error, which is corrected by taking up one-half of it by means of the adjusting nuts on the level case, and the other half with the leveling screws of the instrument. This operation is repeated until the bubble remains in the center.

To accomplish a proper adjustment of the level to the line of collimation, it becomes absolutely necessary that the collars be of equal diameter. We have already referred to the importance of even collar dimensions, and have laid great weight upon this requisite; and here again we shall point out the errors to which a neglect therein may lead. A Y-level in such an event is not any better than a dumpy, and will have to be adjusted as such.

Providing the Ys are filed out to the same absolute angle, the instrument may still be adjustable in all its parts:—the spirit level may be made parallel to the line of the bottom of the collars; the Ys may be so adjusted that the bubble will remain in the center of the tube; the line of collimation may be brought to the center of revolution of the telescope; and this reversed end for end in the Ys, leaving the bubble in the middle, even if there be some difference in the diameter of the collars. It is the general opinion that after level, Ys and cross-wires are adjusted, the instrument must be correct. This is by no means certain, as the least difference in the size of the collars will throw out the line of collimation considerably. This difference is sometimes found in new instruments, and is also produced by unequal wear,

denting, etc. It is therefore advisable that the equality of the collars should be tested from time to time, which is done by a method given further on.

2D ADJUSTMENT.—To place the level at right-angles to the vertical axis of the instrument.

Operation.—Turn the instrument so that the telescope shall stand over the line of two opposing leveling screws, and bring the bubble to the center of the tube; then turn the instrument 180 degrees on its center. If the bubble shows any displacement, correct one-half of it by means of the nuts under the bar at the Y supports, and one-half by the foot-screws. Several trials will make the correction perfect.

3D ADJUSTMENT.—To place the cross-web in the optical axis of the telescope, so that the intersection will remain on an object in revolving it.

Operation.—Set the intersection of the hairs on a point about two hundred or three hundred feet distant, then revolve the telescope in its Ys half-way, so as to have the level case on top. If the wires have moved from the point, bring them back one-half of the amount of the displacement. Try again, and repeat the operation if necessary.

The eye-piece may then be properly aligned and directed by the four black capstan-headed screws (nearest the eye-end of the telescope), so that the field of view shall appear evenly divided by the cross-hairs, as already explained.

In this, as well as in any other telescope, we assume that the tubes are straight, the object-glass well centered, and the slide well fitted. If such be not the case, the telescope can only be adjusted for certain distances. It is urged by some makers that it is almost impossible to produce straight tubes, and that, therefore, the object-slide must be adjustable. This, however, is entirely erroneous. Perfectly straight tubes *can* be made, if the necessary time and money be expended, which is the only requisite. In a great many instruments sold today, you will find that the object-glass is not centered, that the slide is poorly fitted, and that all these inaccuracies, which are not apparent at a glance, prove more injurious than ever if the tubes are not quite straight. It must also seem clear to any one that the constant working of the slide in an adjustable ring would loosen the screws and cause considerable annoyance.

PARALLAX is adjusted by moving the eye-piece in or out until a clear and distinct view of the cross-hairs is obtained, as in the case of the transit already described.

THE COLLAR TEST.—After the instrument is properly adjusted, the equality of the collars may be ascertained in the following manner:

Operation.—Make two bench-marks, place the instrument exactly midway between them, and find their true difference of level by reading leveling rods set upon them. Now place the instrument near one of the bench-marks and read the rods again. If the difference of the reading is equal to the true difference of level, the collars are of equal diameter, and the line of collimation is at right-angles to the vertical axis of the instrument. This test, once made, holds good ever after, as it shows that the collars are true, and consequently that a correct adjustment is assured of all its other parts, as already described. But it need hardly be mentioned that denting, the settling of sand particles and unequal wear will also affect the adjustment in the same manner.

If the test shows that the line of collimation is *not* perpendicular to the line of the vertical center, then the collars are of unequal diameter, and the instrument is really nothing more or less than a dumpy level, as this defect deprives it of all the advantages for an easy and convenient adjustment, which characterizes the Y-level in comparison with the dumpy.

This defect may, however, be temporarily remedied or adjusted in the same manner as the line of collimation in the dumpy level is adjusted, but it must ever thereafter remain permanently in its Ys, as it would, if reversed end for end, double the error which existed previous to this adjustment.

The correction may also be made by displacing the horizontal cross-hair to the extent that the line of collimation shall be truly horizontal and, at the same time, parallel with the axis of the spirit level; but, in that event, there will be no longer any agreement with the optical axis, which again gives rise to a number of inaccuracies that cannot be obviated.

A Y-level, in order to deserve that name at all, must have equal diameters of its collars; and if that is not found after a crucial test, the instrument maker should be called upon to remedy this discrepancy.

No doubt can possibly exist in the mind of any engineer of the absolute necessity of the collar test. Considering the required parallelism of the axis of collimation and the axis of the spirit level, he must know that a contact can only be made between telescope and Ys by means of the collars, whose exteriors may either be parts of the surface of a cylinder, or that of a cone, and that the required parallelism is

only possible in the former case. If one collar exceed the other in diameter, the centered level bubble, if reversed in the Ys, will indicate a displacement corresponding to four times the angle intercepted between the collar axis and that of the spirit level. No further demonstration of this fact is necessary.

Of the Dumpy Level.

In principle, the same laws govern the requirements of the dumpy that hold good in the Y-level. Although its construction differs, the condition of its line of collimation, optical center and level vial must be such as to bear that universal relation to each other which we have fully explained in the other instruments. It is not difficult to make all the necessary adjustments properly, although it may not appear quite so handy to correct its errors as in the case of the Y-level. Once adjusted, however, the instrument will remain so for a long time, and it will give the operator considerable satisfaction, if used with the ordinary care.

The adjustments of the level, and the telescope for collimation, will now be briefly mentioned.

Put on the sun-shade, and focus the eye-piece until the hairs are distinctly visible and the parallax destroyed; then proceed as follows:

Operation.—Turn the instrument so that the telescope shall stand directly over the line of two opposing leveling screws, and draw the bubble to the middle of the tube by means of the foot-screws. Then turn the instrument on its center 180 degrees, and if the bubble remain centered the adjustment is perfect. Any displacement, however, will have to be corrected by taking up one-half of it with the capstan-headed screws attached to the level case, and the other half by the foot-screws. This operation must be repeated several times, in directions normal to each other—that is, over one set of opposing foot-screws as well as over the other, until the telescope may be swung in any position and the bubble will remain in the middle. See that the adjusting screws of the level vial are firm, yet avoid all unnecessary force in tightening them; all cramming is injurious, and tends to destroy the proper degree of refinement required.

After having set the diaphragm so that the cross-hairs shall be absolutely horizontal and vertical, which is easily done by loosening the capstan-headed screws and turning the diaphragm slightly, being guided by some point bisected by the horizontal hair, we now proceed to adjust the cross-hair, which must be brought into the collimation line. Several methods are known; the one which is always available,

however, is that by means of stakes and level-readings upon them, and it is to this that we shall confine ourselves here.

Operation.—Choose a piece of ground nearly level, set up the instrument and center the bubble. Drive a stake (point 1) firmly, say two hundred or three hundred feet from the instrument, in any convenient direction therefrom. Hold the level rod upon it and take a reading. Now point the telescope in the opposite direction, the bubble being centered, and plant another stake (point 2) at the same distance from the dumpy, driving it until the rod shall read the same as upon the first point. These two stakes are on the same level. Now set up the instrument abount ten or fifteen feet from the first stake, and bring the bubble to the center; take a rod-reading on point 1, and then on point 2. If the two readings are alike, with a truly centered bubble, the hair is collimated. If there is any difference, take up nearly all of it by moving the diaphragm with the cross-hairs either up or down, as already explained. Repeat this operation until the readings on points 1 and 2 are identical, when the instrument is in adjustment.

The vertical hair is of no particular importance.

With these precautions, a dumpy level may be made absolutely accurate, and there is no reason why, for any of the land surveyors, and for nearly all of the engineer's work, this compact and steady instrument should not meet every requirement. We frequently discuss its merits with our customers, and have never hesitated to recommend it.

Test of Telescopes in General.

If a telescope is to be tested for its qualities, make sure that all its lenses are perfectly clean.

To test for *definition,* use small, clear print, and view it from a distance of from thirty to fifty feet. If the print appears clear and well defined, and fully as legible at this distance as if viewed with the naked eye at the distance of distinct vision, the surfaces of the object-glass are perfect and well finished. If, on the contrary, the print appears dull and indistinct, and the finer details illegible, or even invisible, the surfaces are imperfect and faulty, for the rays proceeding from the various points of the object are not refracted to their corresponding points in the image.

Indistinctness may be caused by *spherical aberration.*

To test this, cover the object-glass with a ring of black paper, reducing the aperture to one-half; again focus small print to distinct vision; remove the ring of black paper and cover the center of the object-glass (previously left open), then mark how much the object-

glass has to be moved in or out for distinct vision. If the spherical aberration has been reduced to a minimum, very little, if any, slide motion is necessary to obtain a distinct view under both tests. The amount of movement, however, constitutes a measure for the spherical aberration of the object-glass.

Another test, but not as good as the one just mentioned, is to focus an object to distinct vision; then slide the object-glass in or out, observing at the same time the quantity of motion necessary to render the object indistinct. If the spherical aberration is completely corrected, the object should, theoretically, be rendered indistinct by the slightest motion of the lens; but, practically, this is not the case, as the eye will accommodate itself in a measure to the difference of divergence of the rays, caused by the motion, in or out, of the object-glass, in the same manner as it will accommodate itself to near and distant objects when viewing without the aid of lenses. So, if the image formed by a perfect object-glass is viewed by another perfect lens of long focal length, say six inches, the object-glass might be moved in or out one-fourth of an inch from the point of distinct vision, and the object will still appear comparatively clear, as the one-fourth-inch motion, with an eye-lens of such long focal length, cannot cause enough difference in the divergence of the rays to prevent the accommodation of most eyes to it. The shorter the focal length of the eye-lens, the more rapid will be the change of divergence or convergence of the rays with a certain amount of motion; therefore, the second test is only applicable with eye-pieces of very high power, which, at the slightest motion in or out, will cause a sufficient amount of divergence of the rays to prevent the accommodation of the eye to the change.

To test the *chromatic aberration,* either a celestial body or a white disc should be selected for an object.

Focus the object to distinct vision, thereupon move the object-glass slowly in and out alternately. If, in the first instance, a light yellow ring is seen at the edge of the object, and in the second one a ring of purple light, the object-glass may be considered perfect, as it proves that the most intense colors of the prismatic spectrum (orange and blue) are corrected.

To test the *flatness of field,* take a square, flat object, the sides of which are about four inches long and perfectly straight—the best object is a heavily-lined square, drawn on white paper with india ink. Sight this object from such a distance that it will nearly fill the field of view of the telescope, and see if it still appears flat and its sides perfectly

straight; if so, the telescope is a good one. If, on the contrary, the object appears distorted, *i. e.*, if the sides, instead of being straight, form curves and the surfaces appear concave, instead of flat, the telescope is not good, for it shows that the proportions of foci, aperture and distances between the different lenses are not according to the laws of optics; owing, generally, to the attempt to force the magnifying power beyond its limits.

As all the refractions of light in the telescope are caused by flat and spherical surfaces, it is evident that the edge of a round flat object, when used for the above test, cannot be distorted, but that the surface only will appear concave to a keen observing eye. A telescope which distorts the image to a perceptible degree will not, however, cause any errors in common use, if only one point in the lens is taken in all observations, but it is decidedly objectionable in stadia measurements, where two points in the field of view are used at the same time.

To Find the Magnifying Power of a Telescope.

A practical method for finding the magnifying power, available to anyone, which does not require any apparatus, taking up only a few moments' time, is the following:

Set up the instrument, and about twenty or thirty feet therefrom hold up a graduated rod. Observe the rod with one eye by direct vision, and with the other through the telescope. Assume a certain space on the rod, say the height of a numeral, or two sharply drawn lines, and count the number of divisions on the rod in that space; then observe the number of divisions that are seen by the naked eye in the same space enlarged. The ratio between the two is the power sought. It is the reading of a magnified space of known length on the graduated face of the rod. With a little practice both eyes will be able to distinguish the rod divisions at the same time. If what is known to be 0.1 of a foot, is enlarged by viewing it through a telescope so as to cover the space of 2.4 feet as seen by the unaided eye, the magnifying power is 24 for the distance in focus. The real power is somewhat less, for as the tube of the telescope is drawn out for near objects, the power necessarily increases. The magnifying power obtained by this method holds good for the distance that the rod can be read by the unaided eye, and it is always somewhat greater than the actual power.

For a very accurate determination of the magnifying power, it is necessary to ascertain the focal length of the objective and that of the eye-piece, in order to compare them and to find their proportion. While the former is easily obtained by a direct measurement from the objective

lens to the cross-hairs, the latter, usually containing an entire system of lenses, presents numerous difficulties. For this purpose we possess an apparatus especially designed for us.

Dividing the focal length of the objective (when the telescope is focused to mean distance) in millimeters, by the equivalent gives the magnifying power of the telescope under consideration.

If any of our customers want the focal length of an eye-piece determined, we shall cheerfully do so, without charge, upon receipt of it, which should be sent carefully packed.

Adjustments of the Plane-Table Alidade.

Without going again into all the details of instrumental adjustments, it behooves us to enumerate the points required of this instrument when in proper condition. These are:

1st—That the *fiducial edge* of the rule be absolutely straight;

2d—That all *parallax* be destroyed, by placing the cross-hairs in proper focus;

3d —That the line of collimation move in a vertical plane;

4th—That this plane be normal to the plane of the ruler;

5th—That the same plane also intersect the fiducial edge of the ruler, or at least be parallel thereto;

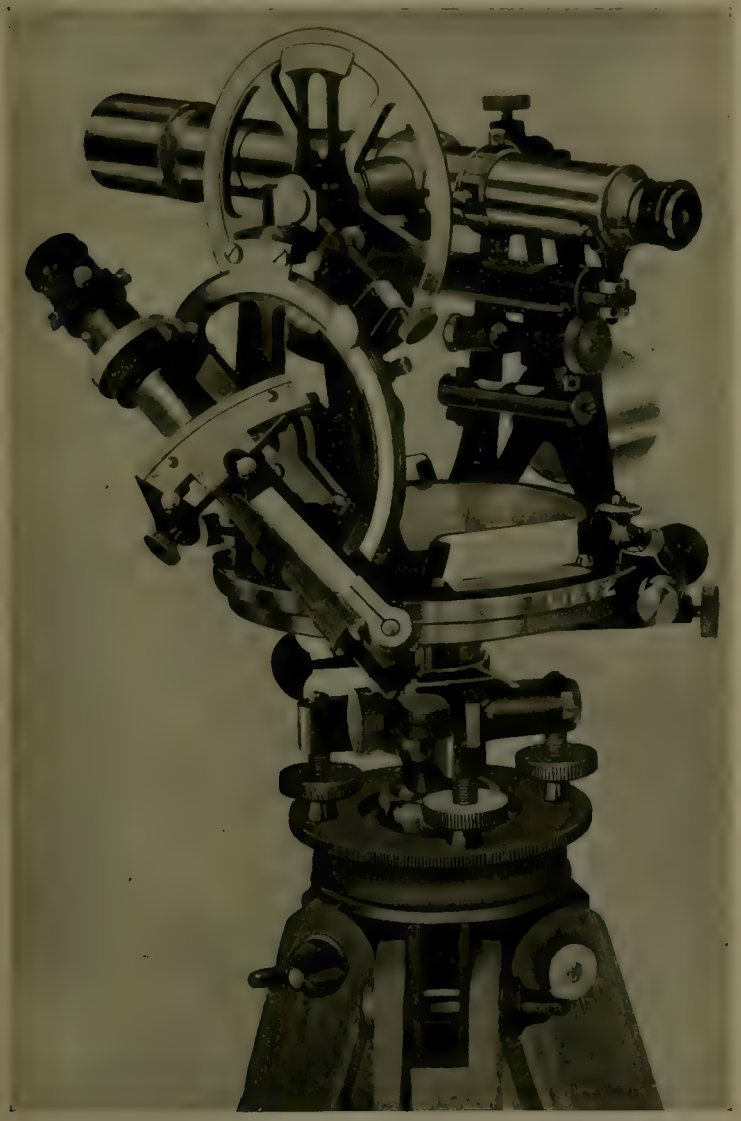
6th—That during parallelism of the optical axis and the fiducial edge, the zeros of the vertical arc and its vernier correspond.

This instrument is used in the topographical departments of the U. S. Coast and Geodetic Survey, and the U. S. Geological Survey, and is exclusively applied in mapping the topographical features of the country in Europe, usually by officers of the army, who control these surveys, after the triangulation points have been established.

This method of surveying has been constantly improved in practice, particularly by the experts of the Geological Survey, and it may be safely said that, with the required accuracy, nothing surpasses it for small-scaled work in speed and application. All the bulky parts of the table have been reduced to a minimum, so that it may be handled with comparative ease in the roughest mountain country.

We refer our readers to appendix No. 22 of the Coast Survey Report of 1865, which may be had separately in bound book form, called *The Plane-Table and its Uses,* as an excellent theoretical and practical treatise of this interesting subject. Price $2.00.

For Plane-Tables, see pages 116 to 120.



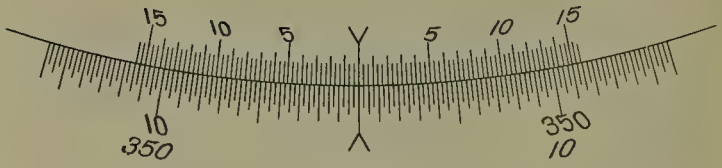
LIETZ TRANSIT WITH SMITH SOLAR ATTACHMENT

For full description see page 95.

METHODS OF GRADUATING LIETZ INSTRUMENTS

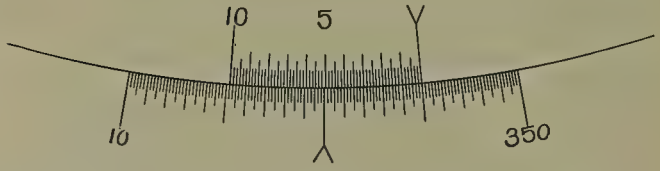
No. 1

Double vernier reading to 30". Circle graduated to 20'.



No. 2

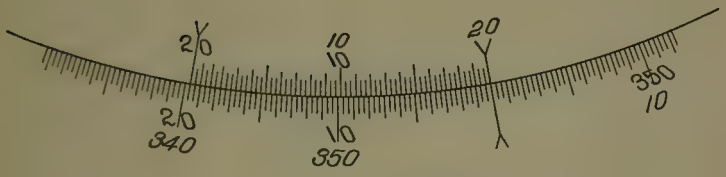
Double vernier reading to 20". Circle graduated to 15'.



No. 3

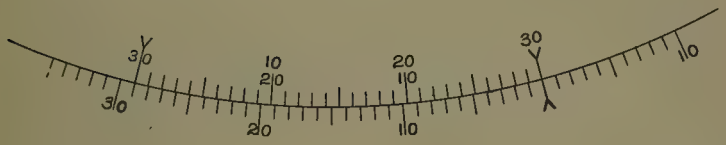
Single vernier reading to 10". Circle graduated to 10' with one row of figures.

AND POPULAR STYLES OF VERNIERS FURNISHED



No. 4

Single vernier reading to 20". Circle graduated to 20' with two rows of figures.



No. 5

Vernier reading to 2'. Circle graduated to single degree.

No. 6

Double vernier reading to single minutes. Circle graduated to 30'.

PART II

ILLUSTRATED CATALOGUE AND PRICE LIST OF

MODERN ENGINEERS' AND SURVEYORS' INSTRUMENTS

AS MADE BY

THE A. LIETZ COMPANY

INTRODUCTION

The following illustrations show the principal articles we manufacture, being, in the case of this section, almost exclusively confined to instruments required by the civil, mining, irrigation, hydraulic and military engineer, for making accurate measurements and surveys for any purpose whatever.

Of the surveying instruments each illustration, or plate, is complete within itself. Every feature is carefully noted, together with the price and a general description in a condensed form. The additional accessories that may be had in each instance are also enumerated and their prices given. It is well, however, that the engineer should consult the preceding part of this Manual, wherein every detail is carefully described and extensively discussed. If pains are taken to look this over, the reader will obtain such information as would be given him in the salesroom.

Every article has been numbered, and by these numbers our customers may order, without going into a minute description of the articles wanted. For example:

"Send me transit No. 4 (1919), with the following extras....." is all that is required to designate to us exactly what is desired by our patron.

In ordering please mention the issue of the catalogue, as the numbers of preceding issues necessarily conflict.

See also Telegraph Code on pages 66 and 67.

With the detailed information on its succeeding page, every plate becomes a complete price list of the particular instrument illustrated. Every effort has been made to make this part of the book as intellig-

ible as possible, without the necessity of searching over numerous pages to gather information.

Although we shall make any instrument of precision called for, we desire to state clearly that we have made a particular specialty of engineers' and surveyors' instruments, because there is for them alone a demand at the present time, and for this reason our shop facilities have been especially designed and improved for the manufacture of these articles.

If instruments for a more scientific purpose are wanted, for astronomical or geodetic work, for instance, we can either *make* them on a special order, or we can *import* them for our customer, having made arrangements in Europe which enable us to sell such instruments as cheaply as anyone in the United States. For institutions of learning we import without payment of duty.

All our products have been priced commensurate with their quality and deductions are not made from our price list, which agrees favorably in all its quotations with those of the best Eastern firms.

We furnish a first-class article at a fair price, and our goods stand upon their individual merit. It has been our object to create the best that the instrument maker's art can make or devise, and with the records of the past decades before us we feel that we have been successful in every way.

THE A. LIETZ COMPANY.

Gradienter Attachment to Vertical Motion
Price $5.00
If supplied with movable head which admits zero setting
Price $15.00

TELEGRAPHIC CODE

TO ACCOMPANY THE THIRTEENTH EDITION OF THE MANUAL OF MODERN SURVEYING INSTRUMENTS AND THEIR USES, TOGETHER WITH CATALOGUE AND PRICE LIST.

THE A. LIETZ COMPANY

San Francisco, U. S. A.

Cable Address: CYCLOTOMIC, San Francisco, U. S. A.
We have A. B. C., Fifth Edition, and the following code.

Transits and transit theodolites, except Nos. 22, 23½ and 24½, are supplied with solid silver graduations (unless ordered to the contrary), and all complete transits and transit-theodolites are furnished with stadia lines, fixed 1:100 (unless ordered to the contrary).

TRANSITS AND THEODOLITES

Catalogue No.	Code Word	Catalogue No.	Code Word
No. 1	Bugbear	No. 6	Building
" 2	Buggy	" 7	Bulbous
" 3	Buglehorn	" 8	Bulged
" 4	Bugler	" 9	Bulimy
" 4B	Bulldoze	" 12	Bullcalf
" 4BC	Bullfrog	" 13LV	Bulrush
" 4BM	Bulldog	" 13LVC	Bulshape
" 5	Bullcow	" 23	Bullet
" 5L	Bullfray	" 23½	Bullion
" 5LV	Bulltrout	" 24	Bulwark
" 5LVC	Bullfish	" 24½	Bullway

PRELIMINARY TRANSITS

No. 22 ..... Bullock

Y LEVELS

No. 19 ..... Bumboat
" 19H ..... Bombay
" 25 ..... Bombard

DUMPY LEVELS

No. 20 ..... Bumper
" 20M ..... Bumkin
" 21 ..... Bumptious
" 21B ..... Bumphead

ALIDADES

No. 30 ..... Cordial
" 31 ..... Cordate
" 32 ..... Cordwain
" 32LC ..... Cordweight

EXTRAS FOR TRANSITS AND LEVELS

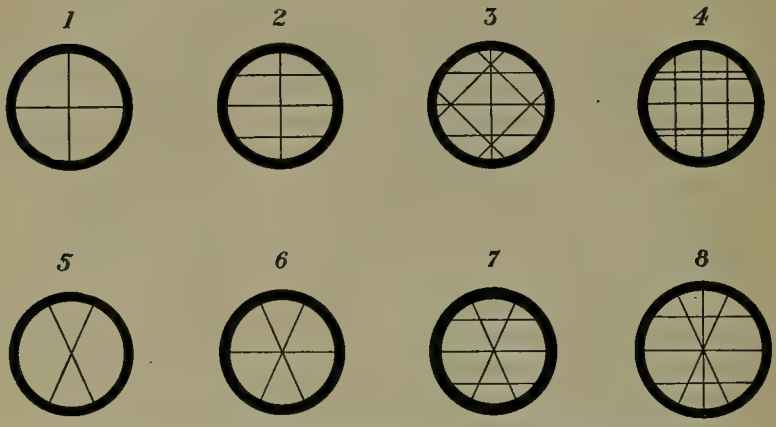
Made of Hard Aluminum Alloy ..... Culotte
Verniers Reading to 30 sec. on Horizontal Circle ..... Cullyism
" " 20 sec. " " " ..... Culminate
Gradienter Attachment ..... Culpable
Gradienter with Movable Head ..... Culpate
Variation Plate ..... Culprit
Arrangements for Offsetting Right Angles ..... Cultivate
Striding Level to Axis of Telescope ..... Cultrated
Reversion Level to Telescope ..... Culture
Constructed with 3 Leveling Screws instead of 4 ..... Culverin
3 Leveling Screw Shifting Center ..... Cumber
Prism to Eye-Piece ..... Cumbersome
Extension Tripod in Lieu of Ordinary ..... Cumbrance
Saegmüller Solar Attachment ..... Cumbrous
Smith Solar Attachment ..... Curator
Davis Solar Screen ..... Custard
Burt Solar Attachment ..... Cuticle
Guard to Vertical Circle ..... Cumshaw
Half Length Tripod ..... Cumulus
Detachable Side Telescope ..... Cuneated
Reflector for Illuminating Cross-Hairs ..... Cuneiform
Quick Leveling Tripod Attachment ..... Cunning
Vertical Circle Graduated on the Periphery ..... Cupbearer
Telescope Inverted ..... Cupboard
Mirror to Control Bubble at Eye End ..... Cupid
Agate Fitted Y's ..... Cupidity
Stadia Hairs Fixed ..... Cupola
" " Adjustable ..... Cupping
Split Tripod Legs in Lieu of Ordinary ..... Curdiness

EXTRAS FOR TRANSIT THEODOLITES

Verniers Reading to 20 sec. on a 6¼-in. Horizontal Circle ..... Cupreous
Verniers Reading to 10 sec. on a 7-in. Horizontal Circle ..... Curable
A 5-in. Vertical Arc Reading to Minutes ..... Curacy
A 5-in. Full Vertical Circle Reading to Minutes ..... Curateship
A 5-in. Full Vertical Circle with Opposite Double Verniers Reading to Minutes ..... Curative
Two-Vernier Microscopes ..... Curbing
Long Ground Level to Telescope with Compound Clamp and Tangent Screw Telescope Reversible, Supplied with Gradienter ..... Curbstone
Box Needle on Plate ..... Curbles

EXTRAS FOR PLANE TABLES

34C Johnson Head Tripod ..... Demon
34B Tangent Head Tripod ..... Demolish
34F Planchette, 24x31, with Paper Buttons ..... Drafting
34H " 15x15, " " " ..... Drawn
34L Plumb Bob Arm and Bracket ..... Dropped
34A Trough or Box Compass ..... Drought



The cut shows the different cross wires we set in our instruments as ordered. When ordering please state by number cross wires wanted, as shown above. We employ No. 1 cross hairs and No. 2 stadia hairs unless otherwise specified.

ASSEMBLING AND ADJUSTING DEPARTMENT

ENGINEERS' AND SURVEYORS' TRANSITS

(Double Spindle Repeating)

Nos. 1 to 12

These are elegant instruments, absolutely accurate in all working parts, designed for land surveying and engineering work of a high character and are guaranteed in every detail.

The general dimensions are given to the right of each illustration, as well as the price, and the extras that may be had upon application. By carefully inspecting the plates, the price list and the enumerated extras, the purchaser is enabled to choose the article and any desired accessory, and make an estimate of its cost.

We make each style, if desired, in hard aluminum, which increases the price 15 per cent.

The horizontal circle is graduated to read to either 60, 30 or 20 seconds, two double verniers being provided, placed so as to afford a reading without stepping aside. The vertical arc or circle is graduated to read to 60 or 30 seconds. Each instrument has long compound centers, shifting plates on tripod head, with new improved coupling. The telescope possesses definition, light and power in a high degree. It has the best lenses, achromatic objective and eye-piece. Erect vision. The telescope is reversible and evenly balanced, provided with slide protector, and screw motion for focusing cross-hairs. Furnished in "Torchon" finish. The case has leathern straps, rubber cushions, and contains all the usual accessories. For a minute description of every detail, see first part of the Manual.

No. 1

LIETZ PLAIN PRECISION TRANSIT

No. 6 is the same instrument but of smaller size.

LIETZ PRECISION TRANSITS Nos. 1 to 1 A

Dimensions and Weights

Horizontal Circle (measured to edge of graduation)	6¼ inches	diam.
Compass Needle	4½ "	long
Object Glass	1⅜ "	diam.
Telescope	11 "	long
Magnifying power	24 ×	
Weight	Instrument, 14 lbs.; tripod, 8 lbs.; box, 10 lbs.	
Weight of this instrument if made of hard aluminum	8 lbs.	

Prices of Instruments as Generally Furnished

No. 1 Plain Precision Transit, with horizontal verniers reading to minutes; graduations on solid silver; cross hairs to telescope. Equipped with Lietz patent clutch coupling split-leg tripod. Instrument complete with plumb bob, reading glass, sunshade, adjusting pins, dust brush, etc., in neat polished mahogany case.. $195.00

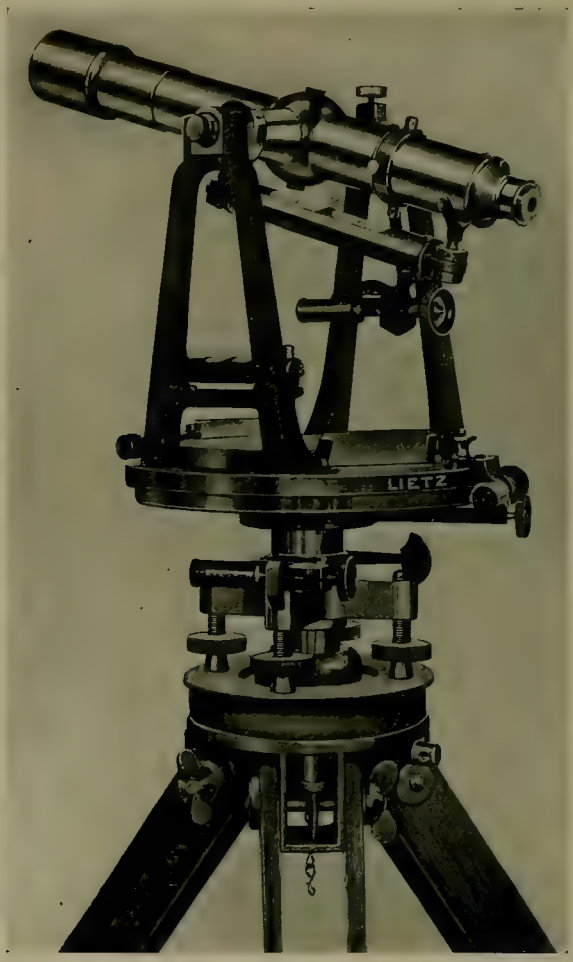
No. 1A, same as Transit No. 1, but of hard aluminum..... 224.00

Extras for Transits Nos. 1 and 1A

For which the additional charge is made. Kindly specify if desired.

Horizontal verniers reading to 30 seconds	$ 10.00
Horizontal verniers reading to 20 seconds	20.00
Variation ring to compass	10.00
Arrangement for offsetting right angles	5.00
Gradienter attachment to vertical motion	5.00
Constructed with three leveling screws instead of four	10.00
Three leveling screw shifting center	5.00
One extension leg in lieu of one split leg	1.25
Protection bag or hood (dustproof)	1.00
Protection bag or hood (waterproof)	1.50
Bottle of fine instrument oil	.35
If desired with limb and verniers graduated on silvered plate instead of on solid silver (to order only) deduct	10.00

For prevailing prices see latest supplement.



No. 2

LIETZ ENGINEERS' PRECISION TRANSIT

Like No. 1 but fitted with level and tangent to telescope.

No. 7 is the same instrument but of smaller size.

LIETZ PRECISION TRANSITS Nos. 2 to 2A

Dimensions and Weights

Horizontal Circle (measured to edge of graduation)	6¼	inches diam.
Compass Needle	4½	" long
Object Glass	1⅛	" diam.
Telescope	11	" long
Magnifying power		24 ×
Weight	Instrument, 14½ lbs.; tripod, 8 lbs.; box, 10 lbs.	
Weight of this instrument if made of hard aluminum		8¼ lbs.

Prices of Instruments as Usually Furnished

No. 2 Engineers' Precision Transit, with horizontal verniers reading to minutes; graduations on solid silver; cross hairs to telescope; level and tangent to telescope. Equipped with Lietz patent clutch coupling split-leg tripod. Instrument complete with plumb bob, reading glass, sunshade, adjusting pins, dust brush, etc., in neat polished mahogany case	$225.00
No. 2A, same as Transit No. 2, but of hard aluminum	258.75

Extras for Transits Nos. 2 and 2A

For which the additional charge is made. Kindly specify if desired.

Horizontal verniers reading to 30 seconds	$ 10.00
Horizontal verniers reading to 20 seconds	20.00
Reversion level vial with protection ring	10.00
Variation ring to compass	10.00
Arrangement for offsetting right angles	5.00
Stadia hairs, fixed, set 1:100	3.00
Gradienter attachment to vertical motion, see page 65	5.00
Gradienter attachment to vertical motion with movable head	15.00
Constructed with three leveling screws instead of four	10.00
Three leveling screw shifting center	5.00
One extension leg in lieu of one split leg	1.25
Full extension tripod in lieu of straight legs	5.00
Protection bag or hood (dustproof)	1.00
Protection bag or hood (waterproof)	1.50
Bottle of fine instrument oil	.35
If desired with limb and verniers graduated on silvered plate instead of on solid silver (to order only) deduct	10.00

For prevailing prices see latest supplement.

No. 3

LIETZ ENGINEERS' PRECISION TRANSIT

Fitted with 5-inch vertical arc provided with a double vernier, reading to minutes.

No. 8 is the same instrument but of smaller size.

LIETZ PRECISION TRANSITS Nos. 3 to 3A

Dimensions and Weights

Horizontal Circle (measured to edge of graduation)	6¼	inches	diam.
Vertical Arc (measured to edge of graduation)	5	"	"
Compass Needle	4½	"	long
Object Glass	1⅜	"	diam.
Telescope	11	"	long
Magnifying power			24 ×
Weight	Instrument, 15 lbs.; tripod, 8 lbs.; box, 10 lbs.		
Weight of this instrument if made of hard aluminum			9 lbs.

Prices of Instruments as Usually Furnished

No. 3 Engineer's Precision Transit with 5-inch vertical arc with verniers reading to minutes; graduations on solid silver throughout; level and tangent to telescope with fixed stadia hairs set 1:100; variation to compass ring. Equipped with Lietz patent clutch coupling split-leg tripod. Instrument complete with plumb bob, reading glass, sunshade, adjusting pins, dust brush, etc., in neat polished mahogany case $258.00

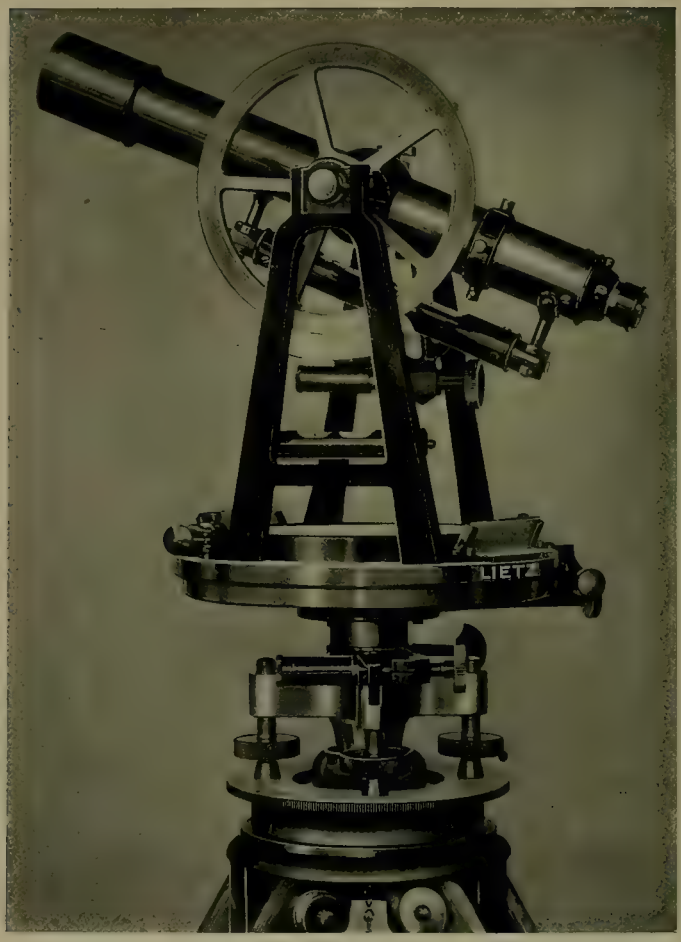
No. 3A, same as Transit No. 3 but of hard aluminum 296.50

Extras for Transits Nos. 3 and 3A

For which the additional charge is made. Kindly specify if desired.

Horizontal verniers reading to 30 seconds	$ 10.00
Horizontal verniers reading to 20 seconds	20.00
Reversion level vial with protection ring	10.00
Arrangement for offsetting right angles	5.00
Gradienter attachment to vertical motion, see page 65	5.00
Gradienter attachment to vertical motion with movable head	15.00
Prism to eye-piece, with neutral glass, see page 93	9.50
Colored object glass cap in lieu of ordinary	1.75
Constructed with three leveling screws instead of four	10.00
Three leveling screw shifting center	5.00
One extension leg in lieu of one split leg	1.25
Full extension tripod in lieu of straight legs	5.00
Protection bag or hood (dust proof)	1.00
Protection bag or hood (water proof)	1.50
Bottle of fine instrument oil	.35
If desired with limbs and verniers graduated on silver plate instead of on solid silver (to order only) deduct	15.00

For prevailing prices see latest supplement.



No. 4

LIETZ COMPLETE ENGINEERS' TRANSIT

Fitted with 5-inch vertical circle, provided with a double vernier, reading to minutes.

No. 9 is the same instrument but of smaller size.

LIETZ PRECISION TRANSITS Nos. 4 to 4A

Dimensions and Weights

Horizontal Circle (measured to edge of graduation)	6¼	inches	diam.
Vertical Circle (measured to edge of graduation)	5	"	"
Compass Needle	4½	"	long
Object Glass	1⅛	"	diam.
Telescope	11	"	long
Magnifying power			24 ×
Weight	Instrument, 16½ lbs.; tripod, 8 lbs.; box, 11½ lbs.		
Weight of this instrument if made of hard aluminum			10 lbs.

Prices of Instruments as Usually Furnished

No. 4 Complete Engineer's Precision Transit with 5-inch full vertical circle fitted with aluminum guard; verniers reading to minutes; graduations on solid silver throughout; level and tangent to telescope with fixed stadia hairs set 1:100; variation to compass ring. Equipped with Lietz patent clutch coupling split-leg tripod. Instrument complete with plumb bob, reading glass, sunshade, adjusting pins, dust brush, etc., in neat polished mahogany case $268.00

No. 4A, same as Transit No. 4, but of hard aluminum 308.00

Extras for Transits Nos. 4 and 4A

For which the additional charge is made. Kindly specify if desired.

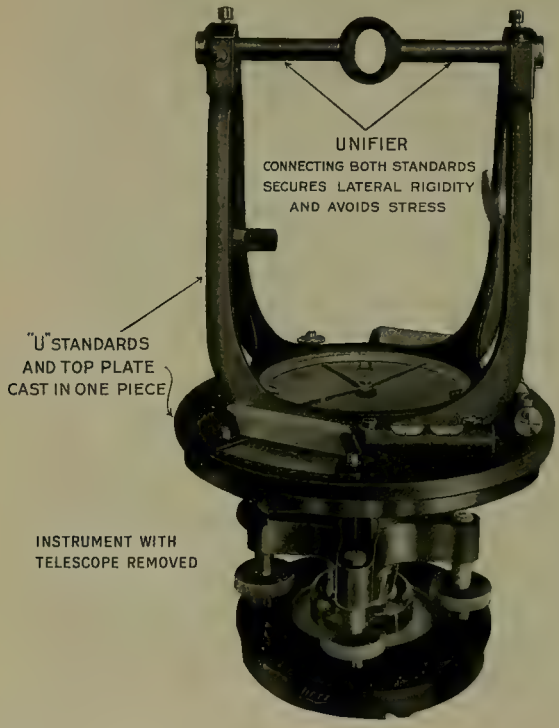
Horizontal verniers reading to 30 seconds	$ 10.00
Horizontal verniers reading to 20 seconds	20.00
Vertical circle graduated on the periphery	25.00
Reversion level vial with protection ring	10.00
Striding level to axis of telescope	20.00
Arrangement for offsetting right angles	5.00
Gradienter attachment to vertical motion, see page 65	5.00
Gradienter attachment to vertical motion with movable head	15.00
Adjustable stadia hairs	10.00
Prism to eye-piece, with neutral glass, see page 93	9.50
Colored object glass cap in lieu of ordinary	1.75
Constructed with three leveling screws instead of four	10.00
Three leveling screw shifting center	5.00
One extension leg in lieu of one split leg	1.25
Full extension tripod in lieu of straight legs	5.00
Protection bag or hood (dustproof)	1.00
Protection bag or hood (waterproof)	1.50
Bottle of fine instrument oil	.35
Inverting eye-piece (see page 24) no extra charge.	
If desired with limbs and verniers graduated on silver plate instead of on solid silver (to order only) deduct	15.00

For prevailing prices see latest supplement.

THE LIETZ TRANSIT THEODOLITES

WITH UNITED STANDARDS, "PATENTED"

Your attention is called to the additional features incorporated in this instrument, consisting of a "Unifier" and a one-piece casting of the top plate and "U" shaped standards, so constructed as to permit of a larger circular compass.



See cross-section view on page 114.

Undoubtedly the most advanced construction in instrument building: Tried and proven.

THE LIETZ PATENT UNIFIER

The "Unifier" is a rigid rod looped in the center to clear the line of sight, connecting both standards firmly, thereby securing lateral rigidity and avoiding stress in a degree heretofore unknown. (See cut with telescope removed.)

The telescope revolves around the "Unifier," and its pivots are cylindrical, resting in "V" shaped bearings which secure the refinement of motion in a vertical plane necessary for precise work.

Its characteristics insure the greatest stability and permanency of adjustments with less liability of injury. All the adjustments, as well as the manipulations, are the same as in other instruments.

This transit has been given practical field tests for several years, which justifies its recommendation as a very superior article.

This type of instrument was used with marked success and high satisfaction on the work of the Hetch Hetchy undertaking in California; also by the Marin Municipal Water District on the tunnel through Mt. Tamalpais, California. Too much cannot be said of the serviceability of this type of construction in instruments.

LIETZ PRECISION TRANSITS Nos. 4BC to 4BCA

The same instruments as our Nos. 4 and 4A, but equipped with Lietz patent unifier. For dimensions and specifications see page 77.

Prices of Instruments as Usually Furnished

No. 4BC, same as Transit No. 4, but with unifier	$295.75
No. 4BCA, same as Transit No. 4A, but with unifier	340.00
Extra for verniers reading to 30 seconds	10.00

The "Unifier," however, does not admit of the arrangement for offsetting right angles.

For prevailing prices see latest supplement.

Nos. 4 B and 4 BA

LIETZ TRANSIT THEODOLITE WITH PATENT UNIFIER

See page 78.

For highest efficiency in engineering work.

LIETZ TRANSIT THEODOLITES Nos. 4 B and 4 BA

Incorporating the feature of the Lietz "Patent Unifier"
An instrument of very superior construction

Dimensions and Weights

Horizontal Circle, measuring to edge of graduation	6¼ inches	diam.
Vertical Arc or Circle, measuring to edge of graduation	5 "	"
Compass Needle	2½ "	long
Object Glass	1⅛ "	diam.
Telescope	8 "	long
Magnifying power		24 ×
Weight	Instrument, 16½lbs.; tripod, 8 lbs.; box, 11½ lbs.	
Weight of this instrument if made of hard aluminum		10 lbs.

Prices of Instruments as Usually Furnished

No. 4B Lietz Transit Theodolite with patent unifier, horizontal limb graduated on solid silver to 20-minute spaces and with opposite verniers reading to 30 seconds; vertical circle graduated on solid silver to 30-second spaces, the vernier reading to single minutes; guard to vertical circle; fixed stadia hairs set 1:100; variation to compass ring. Equipped with Lietz patent clutch coupling split-leg tripod. Instrument complete with plumb bob, reading glass, sun shade, adjusting pins, dust brush, etc., in neat polished mahogany case	$324.00
No. 4BA, same as No. 4B, but of hard aluminum	372.50
No. 4BM, same as No. 4B, but horizontal verniers reading to minutes instead of 30 seconds	314.00
No. 4BMA, same as No. 4BM, but of hard aluminum	361.00

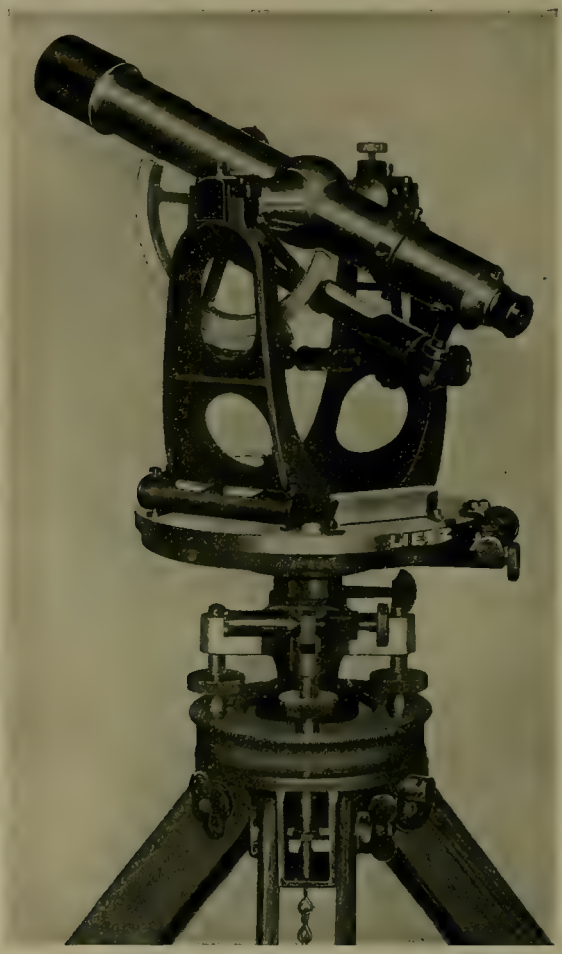
Extras for Nos. 4B to 4BMA

For which the additional charge is made. Kindly specify if desired.

Horizontal verniers reading to 20 seconds	$ 20.00
Horizontal verniers reading to 10 seconds	35.00
Vertical circle graduated on the periphery	25.00
Reversion level vial with protection ring	10.00
Striding level to axis of telescope	20.00
Gradienter attachment to vertical motion, see page 65	5.00
Gradienter attachment to vertical motion with movable head	15.00
Adjustable stadia hairs	10.00
Prism to eye-piece with neutral glass, see page 93	9.50
Colored object glass cap in lieu of ordinary	1.75
Constructed with three leveling screws instead of four	10.00
Three leveling screw shifting center	5.00
One extension leg in lieu of one split leg	1.25
Full extension tripod in lieu of straight leg	5.00
Protection bag or hood, dustproof	1.00
Protection bag or hood, waterproof	1.50
Bottle of fine instrument oil	.35

Inverting eye-piece, see page 24. No extra charge.

For prevailing prices see latest supplement.



No. 5LV

LIETZ TRANSIT THEODOLITES

With U-shaped Standards

Instruments of very superior construction and design. The standards upon which the telescope rests and the upper plate are cast in one U-shaped piece, thus affording far more strength than the ordinary form.

The telescope is reversible in position, as well as exchangeable in its bearings, which are provided with dust caps and screws, to give them the proper friction. The telescope is either erect or inverting. For reasons already set forth (see page 24) the inverting form should be given the preference. The telescope possesses the finest lenses and optical accessories. It has a slide protector and is provided with a sun shade. The cross hairs are focused by a screw motion of the eye-piece.

LIETZ TRANSIT-THEODOLITES Nos. 5 to 5 LVCA

Dimensions and Weights

Horizontal Circle (measured to edge of graduation).... 6¼ inches diam.
Vertical Arc or Circle (measured to edge of graduation).. 5 " "
Telescope .....11 " long
Object Glass ..... 1⅛ " diam.
Magnifying power ..... 24×
Weight.....Instrument, 16 lbs.; tripod, 8 lbs.; box 11 lbs.
The weight of the instrument if made of hard aluminum is.....10 lbs.

Prices of Instruments as Usually Furnished

No. 5 Plain Transit Theodolite (without level to telescope or arc). For illustration of instrument similar in equipment see No. 1 Plain Transit, page 70. Graduated on solid silver to 20-minute spaces and with opposite verniers reading to 30 seconds; cross hairs to telescope. Equipped with Lietz patent clutch coupling split-leg tripod. Instrument complete with plumb bob, reading glass, sun shade, adjusting pins, dust brush, in neat polished mahogany case $240.00

No. 5A, same as No. 5, but of hard aluminum 276.00

No. 5L, same as No. 5, but equipped with level and tangent to telescope. (See illustration of No. 2, page 72)..... 275.00

No. 5LA, same as No. 5, but of hard aluminum..... 316.00

No. 5LV, same as No. 5, but equipped with level and tangent to telescope and stadia hairs set 1:100. Also 5-inch Vertical Arc graduated on solid silver, vernier reading to minutes..... 298.00

No. 5LVA, same as No. 5LV, but of hard aluminum..... 342.50

No. 5LVC, same as No. 5LV, differing only in that it is equipped with 5-inch Full Vertical Circle and aluminum protection guard (instead of vertical arc). All graduations on solid silver, fixed stadia hairs set 1:100, etc., etc. 308.00

No. 5LVCA, same as No. 5LVC, but of hard aluminum..... 354.00

Extras for No. 5 to No. 5LVCA

For which the additional charge is made. Kindly specify if desired.

Horizontal verniers reading to 20 seconds (in lieu of 30 seconds)... $10.00
Horizontal verniers reading to 10 seconds on 7-inch horizontal circle (to order only) 35.00
Opposite double verniers to vertical circle reading to minutes (in lieu of single) 25.00
Two vernier microscopes 15.00
Circular compass with variation to ring..... 20.00
Compass needle in box on plate 3½ inches long..... 20.00
Striding level to telescope axis 20.00

For other features adaptable to these transits see page 92.

For prevailing prices see latest supplement.

No. 9.

LIETZ MOUNTAIN AND MINING TRANSITS Nos. 6 TO 9A

These are beautiful instruments made to correspond in every way with our No. 1 to No. 4 Transits, except in size and weight. Superior and reliable articles for general land surveying, and particularly for mining purposes.

For Universal Transits of similar design see pages 108-109.

LIETZ MOUNTAIN AND MINING TRANSITS
No. 6 to 9A

Dimensions and Weights

Horizontal Circle (measured to edge of graduation)	5	inches diam.
Vertical Arc or Circle (measured to edge of graduation)	4	" "
Compass Needle	3½	" long
Object Glass	1	" diam.
Telescope	8½	" long
Magnifying power		18 ×
Weight	Instrument, 10 lbs.; tripod, 8½ lbs.; box, 6½ lbs.	
Weight of this instrument if made of hard aluminum		6 lbs.

Prices of Instruments as Usually Furnished

No. 6 Plain Mountain Transit (without level or arc). For illustration of instrument similar in equipment see No. 1, page 70. Horizontal verniers reading to minutes; graduations on solid silver; cross hairs to telescope. Equipped with Lietz patent clutch coupling split-leg tripod. Instrument complete with plumb bob, reading glass, sun shade, adjusting pins, dust brush, etc., in neat polished mahogany case $190.00

No. 6A, same as No. 6, but of hard aluminum 218.50

No. 7, same as No. 6, but equipped with level vial and tangent to telescope. (See illustration of No. 2, page 72.) 220.00

No. 7A, same as No. 7, but of hard aluminum 253.00

No. 8, same as No. 7, but with 4-inch Vertical Arc graduated on solid silver, vernier reading to minutes, and with fixed stadia hairs set 1:100; variation to compass ring, and full extension tripod. (See illustration of No. 3, page 74.) 258.00

No. 8A, same as No. 8, but of hard aluminum 296.50

No. 9, same as No. 8, but with 4-inch Full Vertical Circle graduated on solid silver, vernier reading to minutes, aluminum protection guard, and full extension tripod 268.00

No. 9A, same as No. 9, but of hard aluminum 308.00

If any of above transits are desired with graduations on silver plate instead of solid silver, deduct amounts of $10.00 from Nos. 6 to 7A, inclusive, and $15.00 from Nos. 8 to 9A. (To order only.) If extension tripod is not desired with Nos. 8 to 9A and straight leg is preferred, deduct $5.00.

Extras for Transits Nos. 6 to 9A

Please refer to page 77 under No. 4.

For Side Telescope, see page 96. For Solar Attachments, see pages 94 to 97.

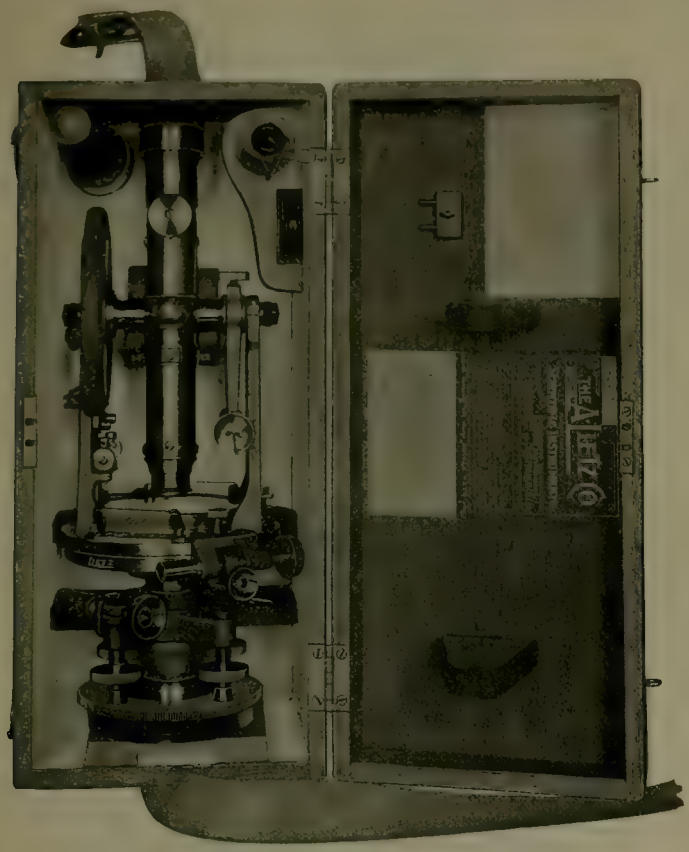
For prevailing prices see latest supplement.

LIETZ MOUNTAIN AND MINING TRANSITS "ALUMINUM"

The illustrations on pages 84 and 88 represent our Mountain and Mining Transits Nos. 9 and 12. While with the introduction of our special aluminum alloy we have been the producers of the lightest instruments for years, yet some of our patrons have expressed a desire to possess an instrument of smaller size, admitting of easier transportation in mountainous country. These transits are made with as much care as our larger instruments; the constructive details are similar, and full reliance may be placed upon the instruments as to the performance of their working parts in every respect. We would especially recommend our friends to order these instruments in our special aluminum alloy, which not only makes them lighter, but adds considerably to the rigidity, lateral strength, and to their steadiness. This statement is made and based upon our experience gained in over twenty years, during which time we have manufactured more than one thousand instruments of our special aluminum alloy, and it is verified by authorities who constantly use them. At first thought the statement may seem paradoxical that an instrument made of lighter material should be steadier than one made of heavier metals, and we are constantly confronted with queries from engineers, when we recommend instruments of the lighter type, whether these will prove steady enough in the wind. It seems that the ordinary opinion is not based upon practical experience but created by the reasonable assumption that heavier weight will offer more resistance to disturbing influences than light weight.

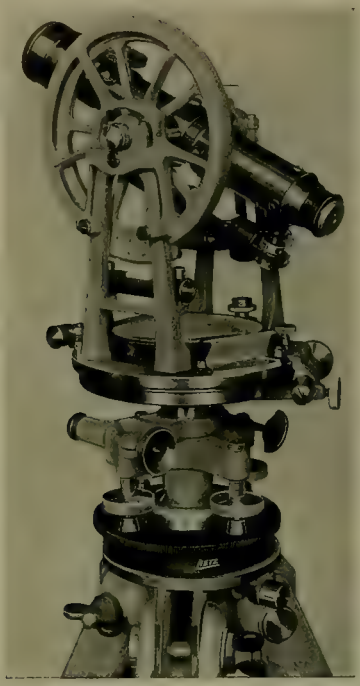
While it cannot be denied that the weight of an instrument adds to its steadiness, it must be borne in mind that instruments have not been made of the older metals in order to gain steadiness, but simply because this was the best material available for the purpose. Wear and resistance in case of accident were the principal features sought. A light material, provided it has these qualities, offers the best opportunity to produce the most rigid instrument, for the reason that it admits of lowering the center of gravity by a judicious distribution of the metals, and this is what we have aimed at and believe we have fully accomplished in our aluminum alloy instruments. These instruments are rigid and firm; they offer more resistance in case of a fall than the heavier metals; the wearing qualities are such that no bushing is required; the coefficient of expansion and contraction is eliminated, so that their adjustments will remain constant under severe conditions. Their qualities during the last twenty years have been so thoroughly tested that we conscientiously recommend them to the profession.

It must be apparent that there cannot be any great difference in price between a large and a small sized instrument. The workmanship in each is alike, and, if anything, more complicated and costly in the



LIETZ RECONNAISSANCE TRANSIT No. 12
In Case

smaller. The only difference is in the quantity of metal used, but, as this cannot possibly amount to much in price, it is more than compensated for by the additional care required in handling the smaller parts. This explanation would hardly seem necessary, were it not for the prevailing impression that all merchantable articles of the same kind shall be rated by their respective sizes. That this cannot obtain in the case of instruments must stand to reason. The price of a transit can only be reduced by omitting certain features, or by changing it to a simpler construction.



LIETZ MOUNTAIN AND RECONNAISSANCE
TRANSITS Nos. 12 and 12A

SPECIAL LEATHER CARRYING CASES
MADE TO ORDER

For prices see page 92.

LIETZ RECONNAISSANCE TRANSITS

Nos. 12 and 12A

Possess a double center, lower clamp and tangential movement, plate movement with the clamp and tangent screw, and sensitive plate levels; two double verniers reading to minutes, placed conveniently for reading without stepping from the eye-piece end. The telescope has a clamp and tangent movement, long level and vertical circle with double vernier reading to single minutes. The telescope is either erect or inverting. It possesses the finest lenses and optical accessories. The stadia hairs are focused by a spiral motion to the eye-piece.

Dimensions and Weights

Horizontal Circle, measuring to edge of graduation	4¼	inches	diam.
Vertical Arc or Circle, measuring to edge of graduation	4	"	"
Compass Needle	2½	"	long
Object Glass	1	"	diam.
Telescope	8	"	long
Magnifying power			18 ×
Weight	Instrument, 7½ lbs.; tripod, 8½ lbs.; box, 4 lbs.		
Weight of this instrument if made of hard aluminum			4½ lbs.

Prices of Instruments as Usually Furnished

No. 12 Reconnaissance Transit, sensitive level vials, graduations on solid silver throughout, with both horizontal and vertical verniers reading to minutes; variation to compass ring; fixed stadia hairs set 1:100; full vertical 4-inch circle protected by aluminum guard, and with full extension tripod equipped with Lietz patent clutch coupling. Instrument complete with plumb bob, reading glass, adjusting pins, dust brush, etc., in neat polished mahogany case $251.00

No. 12A, same as No. 12, but of hard aluminum 288.50

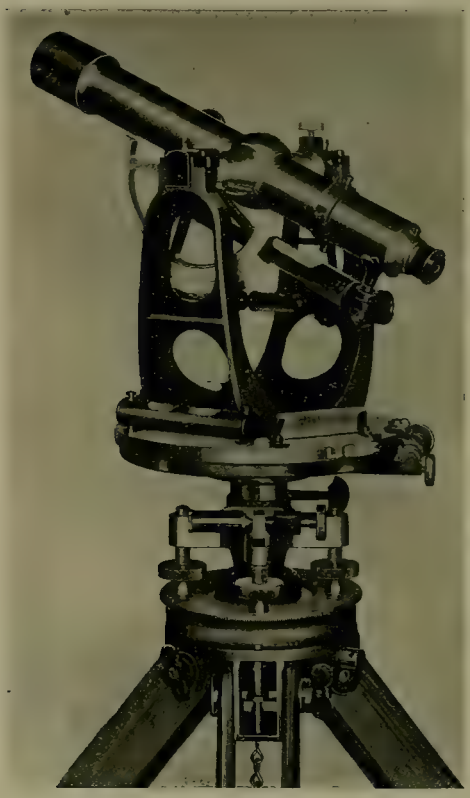
Extras for Transits Nos. 12 and 12A

Please refer to page 77 under No. 4.

For Side Telescopes, see page 96. For Solar Attachments, see pages 94 to 97.

For Preliminary Transits, see pages 106 and 107.

For prevailing prices see latest supplement.



No. 13

LIETZ LIGHT TRANSIT THEODOLITE

For similar instruments in larger sizes see pages 82 and 83.

LIETZ TRANSIT THEODOLITES
Nos. 13 LV TO 13 LVCA

This instrument is of the same type and embodies the same characteristics as our No. 5. It is only of a smaller and more portable size. It possesses a double center, lower clamp and tangential movement; plate movement with the clamp and tangent screw, and sensitive plate levels; double verniers reading to minutes, placed conveniently for reading without stepping from the eye-piece end. The telescope is reversible in position, as well as exchangeable in its bearings, which are provided with dust caps, and screws to give them the proper friction. The telescope is either erect or inverting. For reasons already set forth, the inverting form should be given the preference. The telescope possesses the finest lenses and optical accessories. It has a slide-protector and is provided with a sunshade. The stadia hairs are focused by a spiral motion to the eye-piece.

Dimensions and Weights

Horizontal Circle (measured to edge of graduation)	5	inches diam.
Vertical Arc or Circle (measured to edge of graduation)	4	" "
Object Glass	1	" "
Telescope	8	" long
Magnifying power		18 ×
Weight		Instrument, 10 lbs.; tripod, 8½ lbs.; box, 6½ lbs.
Weight of instrument if made of hard aluminum		6 lbs.

Prices of Instruments as Usually Furnished

No. 13 LV Light Transit Theodolite, with level and tangent to telescope, verniers reading to minutes; graduation on solid silver throughout. Vertical Arc 4 inch, fixed stadia hairs set 1:100. Full extension tripod equipped with Lietz patent clutch coupling. Instrument complete with plumb bob, reading glass, adjusting pins, dust brush, sunshade, etc., in neat polished mahogany case	$265.00
No. 13 LVA, same as No. 13, but of hard aluminum	305.00
No. 13 LVC, same as No. 13, but equipped with 4-inch Full Vertical Circle graduated on solid silver, vernier reading to minutes and and with aluminum guard	275.00
No. 13 LVCA, same as No. 13 LVC, but of hard aluminum	316.00

Extras for No. 13 LV to No. 13 LVCA

For which the additional charge is made. Kindly specify if desired.

Horizontal verniers reading to 30 seconds	$10.00
Circular compass with variation	20.00
Compass needle in box on plate 3½ inches long	20.00
Two vernier microscopes	15.00

For other features see page 92.

For prevailing prices see latest supplement.

COMPETE LIST OF FEATURES APPLICABLE TO LIETZ INSTRUMENTS

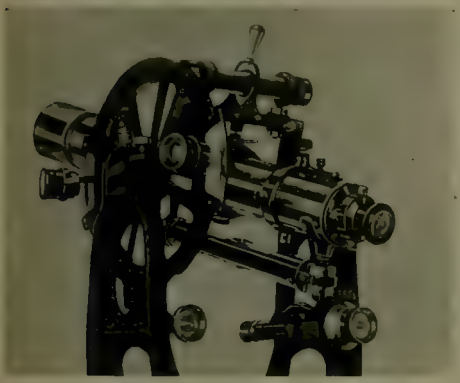
And for which the additional charge is made when not included in the specifications and prices as quoted in price lists.
Please specify if desired.

Verniers reading to 30 seconds on horizontal circle	$ 10.00
Verniers reading to 20 seconds on horizontal circle	20.00
*Verniers reading to 10 seconds on horizontal circle	35.00
†Variation to compass ring for all declinations E. or W	10.00
Striding level to axis of telescope	20.00
Arrangement for offsetting right angles	5.00
Gradienter attachment to vertical motion, see page 65	5.00
Gradienter attachment to vertical motion with movable head	15.00
Reversion level with protective housing (in lieu of ordinary)	10.00
Attachable prism to eye-piece with neutral glass	9.50
Colored glass object cap	2.50
Colored glass eye-piece cap	2.00
Colored glass in shutter of cap	2.50
Elbow zenith eye-piece	20.00
Guard to vertical circle, aluminum	5.00
Vertical circle graduated on the periphery and with guard	25.00
Vertical circle with two opposite verniers (in lieu of single)	25.00
Two vernier microscopes	15.00
Constructed with three leveling screws instead of four	10.00
Three-leveling-screw shifting plate	5.00
Quick leveling head attachment	20.00
Mining bracket for mounting transits in mines, etc.	15.00
Lateral adjuster for transits with four leveling screws	25.00
Folding sights to telescope at right angles to it	12.50
Stadia hairs "fixed," set 1:100	3.00
Stadia hairs adjustable, set 1:100	10.00
Mirror to control bubble of Y levels at eye end	10.00
Protection bag or hood, oil silk, waterproof	1.50
Protection bag or hood, silk, dustproof	1.00
Bottle of fine instrument oil for lubricating centers	.35
Bottle of fine watch oil for general use	.25
Full extension tripod (in lieu of straight when quoted)	5.00
One extension leg (in lieu of one straight when quoted)	1.25
Leather cover for transit box with shoulder straps	$12.50 to 20.00
Leather cover for tripod with shoulder straps	$7.50 to 12.00

*Applicable to Engineers' Transits Nos. 1 to 5 only.
†On all Lietz Transits the variation can be laid off to the nearest minute. See note on page 21.

For prevailing prices see latest supplement.

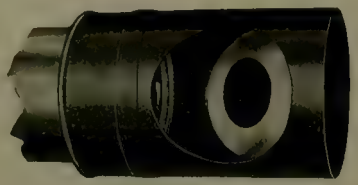
REVERSION LEVEL
For leveling with telescope on back sight. Applicable to any of our transits. Price, extra, $10.00.



DOUBLE OPPOSITE VERNIER ATTACHMENT
Price, extra, $25.00, with Microscopes $40.00

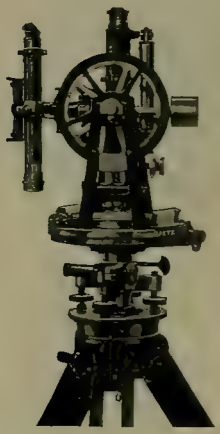
VERTICAL CIRCLE GRADUATED ON PERIPHERY
Price, extra, $25.00

ATTACHABLE PRISM TO EYE-PIECE
Price, extra, $9.50



REFLECTOR SHADE FOR ILLUMINATING CROSS HAIRS
Price, extra, $4.00.

LIETZ SOLAR INSTRUMENTS



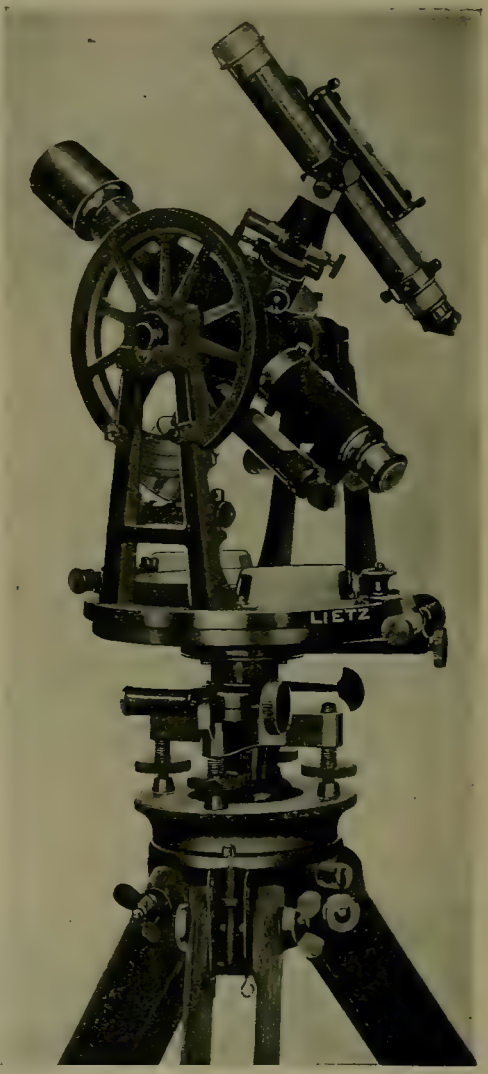
Illustrating use of Saegmueller Solar Attachment as secondary telescope for vertical sighting.

This solar attachment is detachable; it screws into the top of the telescope axis, and becomes a part of the instrument. It answers all the purposes of a side telescope, as shown above. Made in two sizes suitable for engineers' instruments and for the mountain and mining instruments.

No. 16 Saegmueller Solar Attachment (either size) $50.00

Price includes fitting with new instrument.

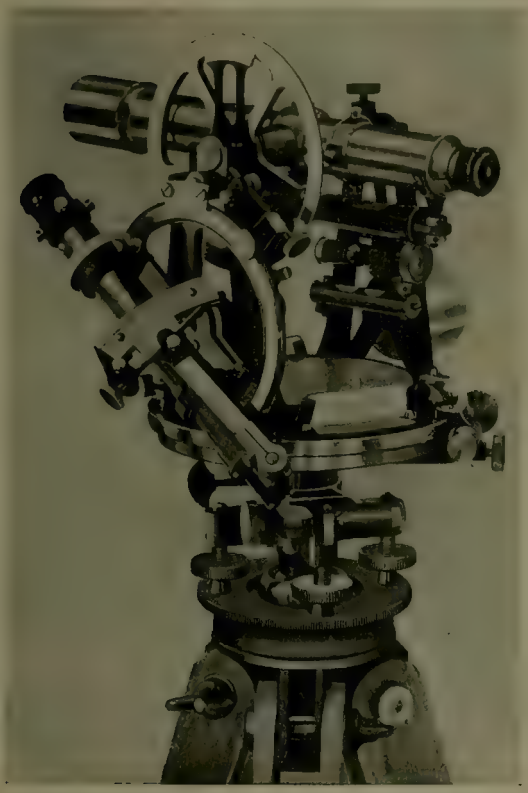
Nominal charge made when fitted to used transit (about $10).



Illustrating Lietz Transit No. 4 fitted with Saegmueller Solar Attachment.

Send for pamphlet on the adjustments of solar attachments.
For prevailing prices see latest supplement.

LIETZ SOLAR INSTRUMENTS



Illustrating Lietz Transit No. 9 fitted with Smith Solar Attachment.

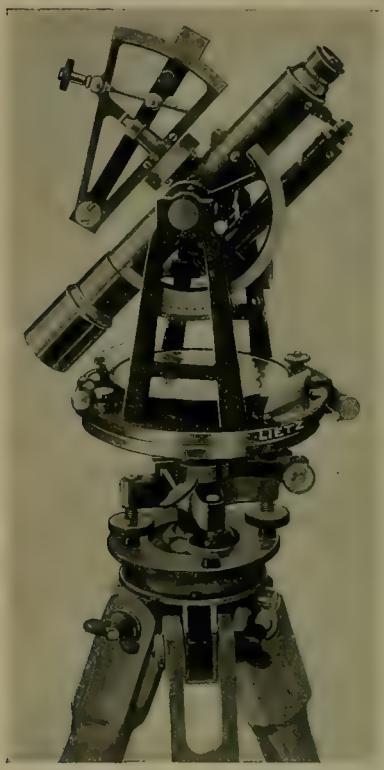
This attachment is fitted permanently to the instrument and therefore becomes part thereof.

No. 16S Smith Solar Attachment (extra) $125.00

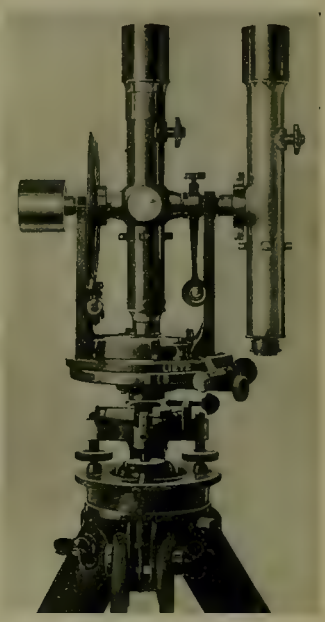
Price includes fitting with new transit.

For prevailing prices see latest supplement.

LIETZ SOLAR AND MINING INSTRUMENTS



Illustrating Lietz Transit No. 8 fitted with Burt Solar Attachment.



Attachable Side or Auxiliary Telescope.

No. 16B Burt Solar Attachment $50.00

No. 17 Attachable Secondary Telescope with Counterpoise. Made of hard aluminum $40.00

Prices include fitting with new transit.

Nominal charge made when fitted to used instrument.

For prevailing prices see latest supplement.

LIETZ SOLAR INSTRUMENTS

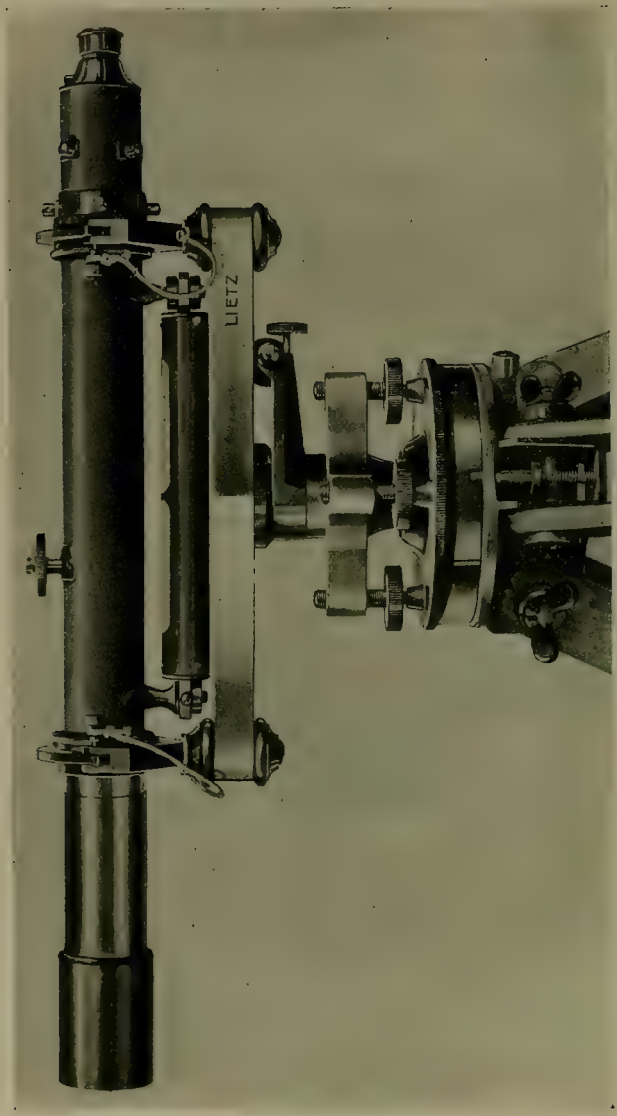
Illustrating Lietz Transit No. 9 fitted with
Davis Solar Screen and Prism to Eye-piece.

No. 17D Davis Solar Screen, with prism for eye-piece of transit..... $15.50

Price includes fitting with new transit.
Nominal charge made when fitted to used instrument.

We make a specialty of repairing and adjusting solar instruments. We have every facility for accomplishing the nicest adjustments in the shortest time.

For prevailing prices see latest supplement.



LIETZ PRECISION ENGINEERS' Y-LEVEL
Nos. 19 and 19A

LIETZ PRECISION Y-LEVEL No. 19

Possesses all recent improvements. Long center; star-shaped construction of the guide for the foot-screws; clamp and tangential movement; sensitive spirit level. The telescope has definition, light and power in a high degree; best achromatic lenses (erect vision) and stadia hairs if desired; is provided with a slide protector, torchon finish. Equipped with Lietz patent clutch coupling split-leg tripod. Instrument complete with sun shade, dust brush, adjusting pins, etc., in neat polished mahogany case.

Dimensions and Weights

Length of telescope	18 inches
Diameter of objective	1⅜ "
Magnifying power	33 ×
Weight	Instrument, 11 lbs.; tripod, 8½ lbs.; box, 8 lbs.
Weight of this instrument if made of hard aluminum	6½ lbs.

Prices of Instruments as Usually Furnished

No. 19 Lietz Precision Y-Level, equipped with Lietz clutch coupling split-leg tripod. Instrument complete with sunshade, dust brush, adjusting pins, etc., in neat polished mahogany case	140.00
No. 19A, same as No. 19, but of hard aluminum	161.00

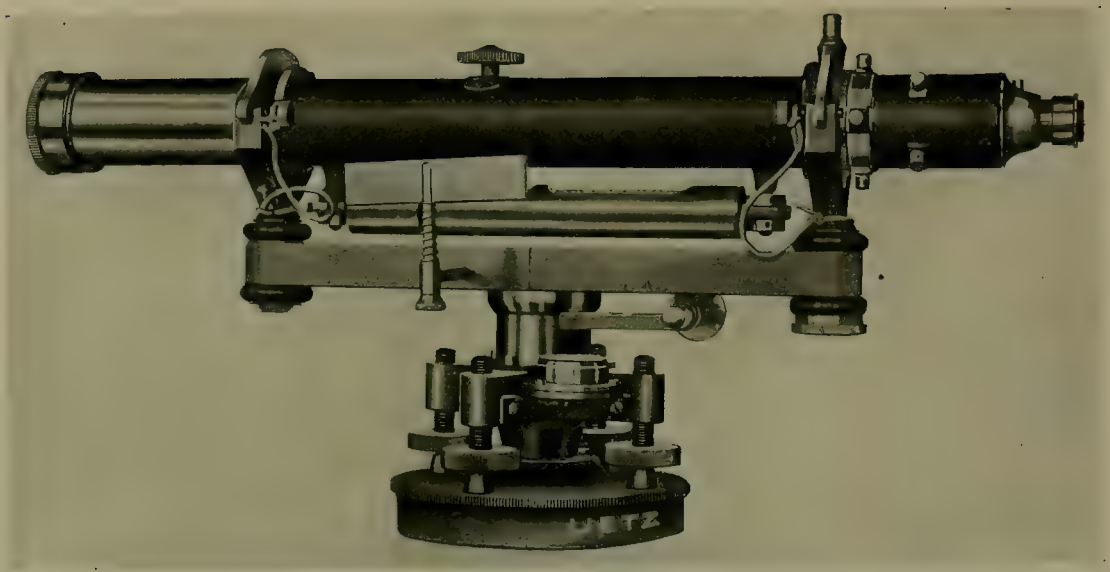
Extras

For which the additional charge is made. Kindly specify if desired.

Mirror to control the bubble at eye end. (See page 100.)	$10.00
Stadia hairs, fixed, set 1:100	3.00
Stadia hairs, adjustable, set 1:100	10.00
Reversion level to telescope, with protective housing	15.00
Three leveling screws on base plate, instead of four	10.00
Protection bag or hood, dustproof	1.00
Protection bag or hood, waterproof	1.50
Bottle of fine instrument oil	.35

For Railroad Y Levels see pages 112 and 113.

For Dumpy Levels see pages 101 to 103



LIETZ HYDROGRAPHIC LEVEL No. 19H and 19HA

No. 19H Lietz Hydrographic Level, same as No. 19 (see page 99), but provided with micrometer screw for the vertical control of one of the Y's and an additional spirit level set normal to the line of collimation. Instrument complete with Lietz clutch coupling split-leg tripod in mahogany case with usual accessories $180.00

No. 19HA, same as No. 19H, but of hard aluminum 207.00

For prevailing prices see latest supplement.

LIETZ PRECISION DUMPY LEVEL No. 20M

No. 20M
LIETZ 16-INCH DUMPY LEVEL
With mirror raised.

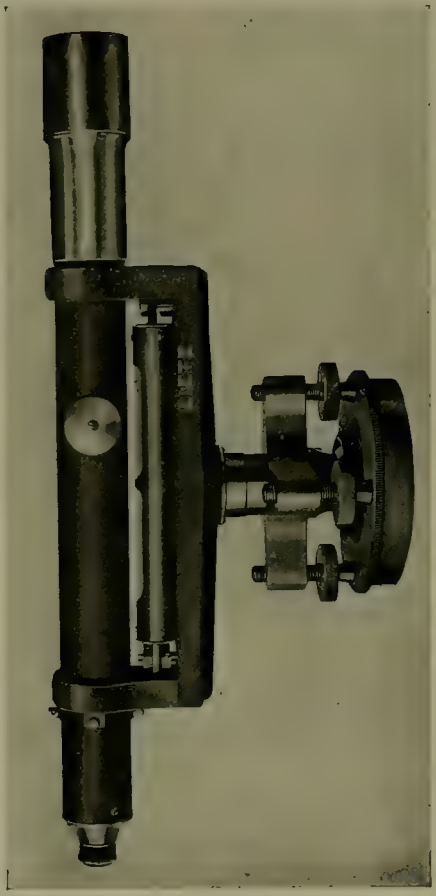
No. 20M
LIETZ 16-INCH DUMPY LEVEL
With mirror attachment folded down.

For complete specifications and details see pages 102 and 103.

No. 20M, same as No. 20 (see next page), but with mirror attachment. Equipped with split-leg tripod with screw coupling. Instrument complete with sun shade, dust brush, adjusting pins, etc., in neat polished mahogany case $110.00

We have every facility for thoroughly overhauling and adjusting levels of all makes and styles. Estimates cheerfully given.

For prevailing prices see latest supplement.



LIETZ 16-INCH DUMPY LEVEL No. 20
Your particular attention is invited to the design and finish.

LIETZ ENGINEERS' DUMPY LEVELS
Nos. 20 and 20T

This is an elegant instrument, adaptable to the best class of engineering work, guaranteed in every detail and proven highly satisfactory. Particular attention is invited to its design and finish.

Long center and most approved construction of the lower parts. Sensitive spirit level, placed under the telescope to lower the center of gravity. The telescope has definition, light and power in a high degree; best achromatic lenses, erect vision and stadia hairs if desired. Is provided with a slide protector and has our Torchon finish.

Dimensions and Weights

Length of telescope	16 inches
Diameter of objective	1⅜ "
Magnifying power	28 ×
Weight	Instrument, 9½ lbs.; tripod, 7½ lbs.; box, 8 lbs.

No. 20 Lietz Improved Dumpy Level, 16-inch, equipped with screw coupling split-leg tripod. Instrument complete with sun shade, dust brush, adjusting pins, etc., in neat polished mahogany case $100.00

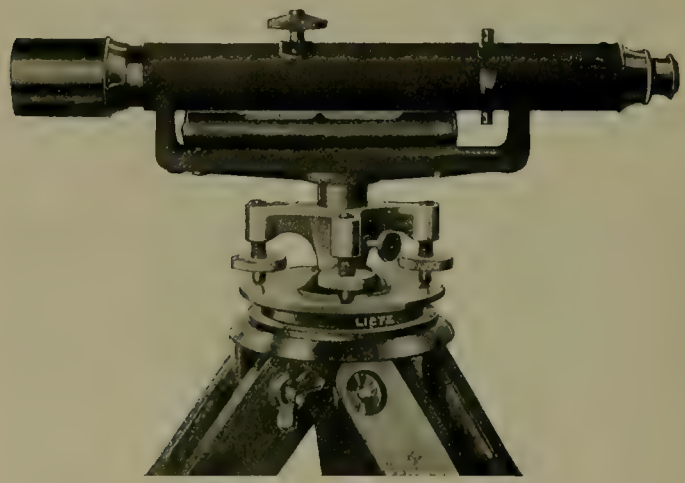
No. 20T, same as No. 20, but fitted with clamp and tangent movement 110.00

Extras for Lietz Dumpy Levels Nos. 20 to 20T

For which the additional charge is made. Kindly specify if desired.

Fixed stadia hairs set 1:100	$ 3.00
Full horizontal circle with vernier reading to minutes	25.00
One extension tripod leg in lieu of straight leg	1.25
Full extension tripod in lieu of ordinary	5.00
Protection bag or hood, dustproof	1.00
Protection bag or hood, waterproof	1.50
Bottle of fine instrument oil	.35

For prevailing prices see latest supplement.



LIETZ BUILDERS' LEVEL No. 21

Efficient and Permanent
in Adjustment

BUILDERS' LEVEL No. 21BC

Fitted with a right-angle bracket and control level for vertical sights

LIETZ BUILDERS' LEVELS Nos. 21 to 21 BC

As made by us for the use of architects, builders, contractors, and for general engineering work not requiring the highest degree of accuracy, the instrument is constructed along the same lines as our No. 20 Precision Dumpy Level, and therefore not liable to get out of order, an important feature, because instruments of this kind occasionally have to be intrusted to men whose duties will not admit of the greatest amount of care. The instrument is far superior to the so-called architects' level, which is built on the principle of the Y-level, and in which novelties are usually embodied to attract the buyer and which tend to make instruments complicated and unreliable, difficult to manipulate, and which usually decrease their strength considerably. Our instrument No. 21 is built for the special purpose of obtaining the simplest form of an accurate and reliable tool and is offered to the profession as an instrument of efficiency at a very moderate price.

Dimensions and Weights

Length of telescope ..... 12 inches
Diameter of objective ..... 1⅛ "
Magnifying power ..... 18 ×
Weight ..... Instrument, 4½ lbs.; tripod, 6 lbs.; box, 3½ lbs.

No. 21 Lietz Builders' Level, 12-inch, equipped with strong straight-leg tripod. Instrument complete with sun shade, adjusting pins, etc., in neat polished mahogany case $45.00

No. 21C, same as No. 21, but fitted with horizontal circle graduated to one-half degree and with index 50.00

No. 21B, same as No. 21, but fitted with right angle bracket (see illustration, page 104) 60.00

No. 21BC, same as No. 21B, but equipped with horizontal circle graduated to one-half degree and with index 65.00

We have every facility for the thorough repairing and adjusting of all makes of Builders' Levels

For prevailing prices see latest supplement.

LIETZ PRELIMINARY TRANSIT No. 22

For many purposes where great accuracy is not required, it is often far more convenient to use some small instrument which will admit of measurements within practical limits. The irrigator, farmer, ditcher, grader, building contractor, gardener, forester, road builder, etc., often require means of obtaining heights and relative positions, for which higher grade instruments would be unnecessarily refined.

It is for such purposes that we have constructed the Lietz Preliminary Transit. This combines portability with accuracy and reliability, within a reasonable limit, at a minimum expenditure. In appearance it is identical to an engineer's transit. It possesses four leveling screws, but no shifting center. The lower axis moves in the star piece which carries the four leveling screws. It is readily clamped in any position by means of clamp and tangent screws. The second spindle carries the top plate, together with the standards and telescope. The compass is centrally located, and has a diameter of three inches. The plate is graduated in the regular way, and this graduation is utilized for reading horizontal angles by means of a vernier to two minutes of arc. The vertical arc is graduated from 0 degree to 100 degrees each way, reading to two minutes by a vernier which is clamped readily into any position on the telescope axis by a milled-head screw, so that the position of the arc, which is stationary on the standard, admits of reading any vertical angle, by means of repetition, if over 90. The telescope is six inches long, has erect lenses, magnifying eight diameters. The telescope possesses a level two and one-half inches in length, and a tangential movement, so that the instrument represents a complete transit of modern construction, having, of course, a limited degree of accuracy, but capable of carrying out preliminaries where high-grade instruments would otherwise have to be used. Every feature of the transit is represented here, and it admits of obtaining results approaching those of the surveyor's transit and level.

Crude instruments are placed on the market to supply the demand for a fairly reliable measuring tool of small cost. These are usually worthless, as they are made without any regard for the underlying principles that should govern the make of such an article. But with the Lietz Preliminary Instrument, for which patent has been granted, the object has been attained. Every part is carefully made and neatly finished, and its cost is less in comparison than the inferior articles usually offered for sale in the market.

LIETZ PRELIMINARY TRANSIT No. 22
[Patented]

Dimensions and Weights

Length of telescope	6 inches
Diameter of objective	¾ "
Length of needle	3 "
Diameter of horizontal plate	3 "
Magnifying power	8 ×
Weight	Instrument, 5 lbs.; tripod, 5 lbs.; box, 2½ lbs.

No. 22 Lietz Preliminary Transit, complete with upper and lower clamp and tangent movements, variation to compass ring, fixed stadia hairs set 1:100. Instrument complete with neat light but rigid extension tripod and in compact carrying case fitted with reading glass, adjusting pins, etc. $90.00

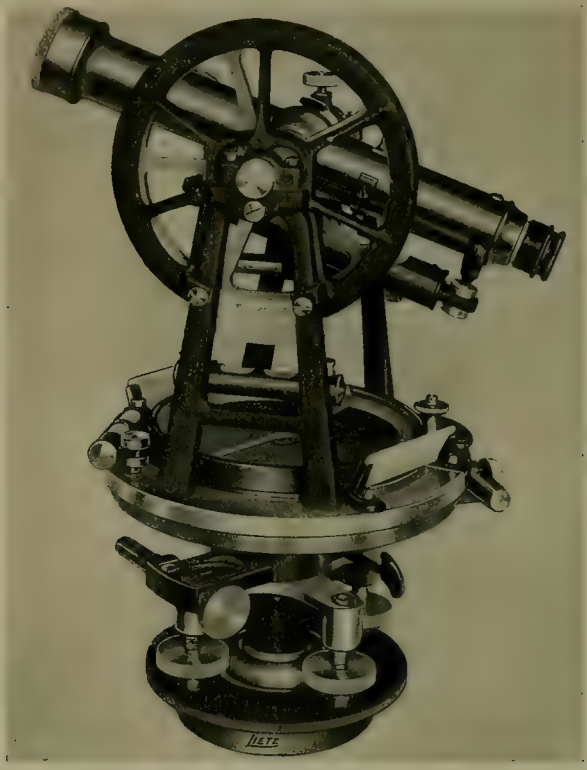
No. 22C, canvas covering case to box of No. 22 ..... 2.50

No. 22TC, canvas covering case to tripod of No. 22 ..... 4.50

For prevailing prices see latest supplement.

LIETZ UNIVERSAL INSTRUMENTS Nos. 23 to 25

Our many years of experience brought us to the conclusion that many classes of work, especially undertakings of comparatively short duration, do not necessarily require instruments made with that degree of refinement that characterizes our "Precision Line."



No. 23
LIETZ "UNIVERSAL" MOUNTAIN TRANSIT

LIETZ UNIVERSAL TRANSIT No. 23

Possesses double centers, lower clamp and tangent movement, plate movement with clamp and tangent screw, two ground and graduated plate levels, horizontal circle provided with shades, reading to single minutes, placed conveniently for reading without stepping from the eye end. Compass needle and graduated compass ring, with variation plate. One of the standards provided for vertical adjustment carrying an achromatic erect telescope, with fixed stadia hairs. It has a long ground and graduated level, clamp and tangent movement, a full vertical circle graduated on solid silver, reading to single minutes by double full vernier.

Dimensions and Weights

Horizontal Circle (measured to edge of graduation)	5	inches diam.
Vertical Circle (measured to edge of graduation)	4	" "
Compass Needle	3½	" long
Telescope	8½	" "
Object Glass	1	" diam.
Weight	Instrument, 9½ lbs.; tripod, 8½ lbs.; box, 7 lbs.	

No. 23 Light Engineers' Transit, with horizontal circle graduated on solid silver verniers reading to minutes; fixed stadia hairs set 1:100; variation to compass ring; full vertical circle graduated on solid silver with aluminum guard. Equipped with Lietz screw coupling split-leg tripod. Instrument complete with sun shade, reading glass, plumb bob, adjusting pins, etc., in neat polished mahogany case $225.00

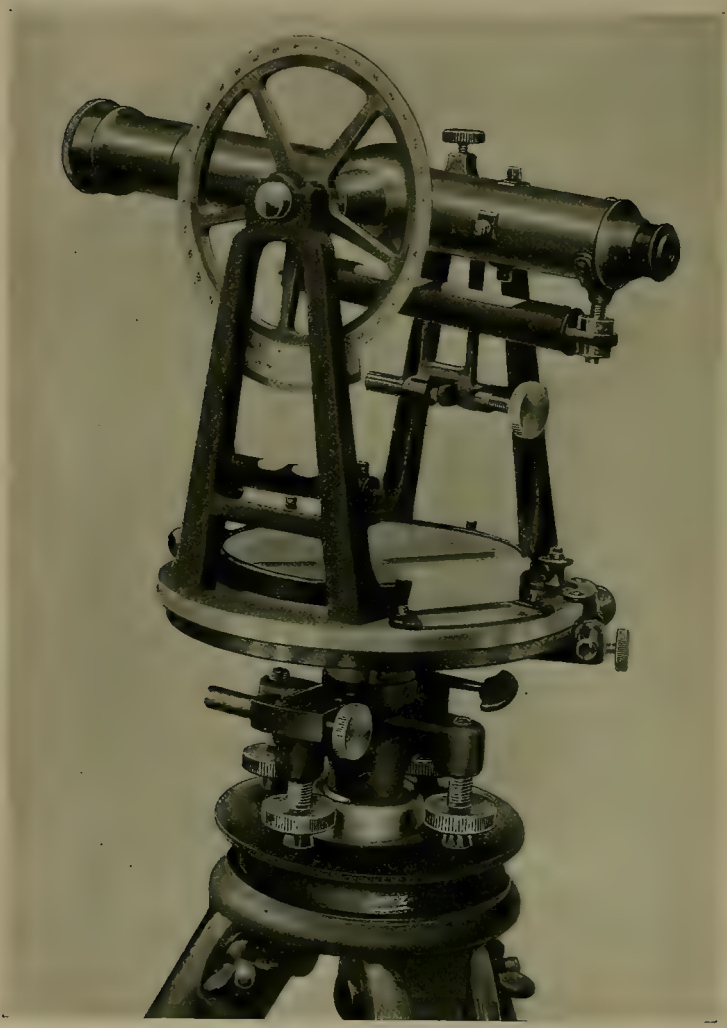
No. 23ET, same as No. 23, but with extension tripod in lieu of straight 230.00

LIETZ UNIVERSAL TRANSIT No. 23½

No. 23½, same as No. 23, but with the following changes: Horizontal circle graduated on heavy silver plate instead of solid silver. It has only one double vernier reading to single minutes and no guard for vertical circle. Instrument in fine mahogany case with all usual accessories and split-leg tripod $175.00

No. 23½G, same as No. 23½, but with guard to vertical circle 180.00

For prevailing prices see latest supplement.



LIETZ UNIVERSAL TRANSITS Nos. 24 and 24½

Illustration of No. 24½.

LIETZ UNIVERSAL TRANSIT No. 24

Possesses a double center, lower clamp and tangent movement, plate movement with clamp and tangent screw, two ground and graduated plate levels, horizontal circle, provided with shade reading to half minutes, placed conveniently for reading without stepping from the eye end. Compass needle and graduated compass ring, with variation plate. One of the standards provided for vertical adjustment carrying an achromatic erect telescope, with fixed stadia hairs, it has a long ground and graduated level, clamp and tangent movement, a full vertical circle graduated on solid silver reading to single minutes by double full vernier.

Dimensions and Weight

Horizontal Circle (measured to edge of graduation)	6¼ inches	diam.
Vertical Circle (measured to edge of graduation)	5 "	"
Compass Needle	4½ "	long
Telescope	11½ "	"
Object Glass	1⅛ "	diam.
Weight	Instrument, 15 lbs.; tripod, 9 lbs.; box, 10 lbs.	

No. 24 Complete Engineer's Transit, with double horizontal verniers reading to 30 seconds; all graduations on solid silver; fixed stadia hairs set 1:100; variation to compass ring; full vertical circle reading by vernier to minutes and protected with aluminum guard. Equipped with screw coupling, split-leg tripod. Instrument complete with reading glass, plumb bob, sun shade, adjusting pins, etc., in neat polished mahogany case $235.00

No. 24ET, same as No. 24, but with extension tripod in lieu of straight-leg tripod 240.00

Lietz Universal Transit No. 24½

No. 24½ the same as No. 24, but with the following changes: Horizontal circle graduated on heavy silver plate instead of solid silver. It has only one double vernier reading to single minutes and no guard to vertical circle. Instrument in fine mahogany case with all usual accessories $185.00

No. 24½G, same as No. 24½, but with guard to vertical circle 190.00

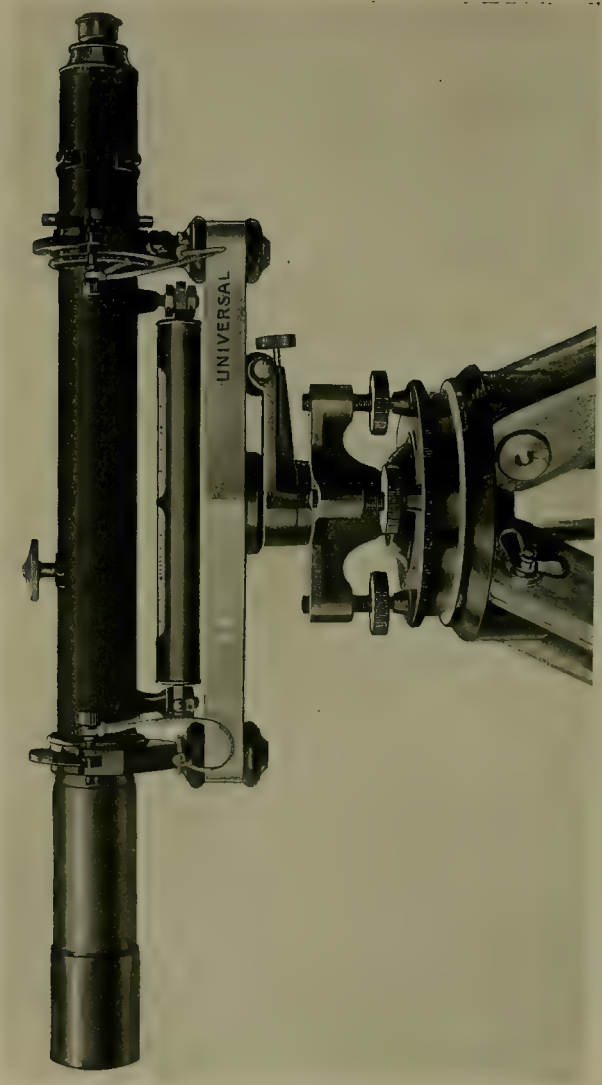
Extras for Transits Nos. 23 and 24½

For which the additional charge is made. Kindly specify if desired.

Extension Tripod in lieu of straight leg tripod	$5.00
One extension leg in lieu of straight leg	1.25
Protection Bag or Hood, dust proof	1.00
Protection Bag or Hood, water proof	1.50
Bottle of fine instrument oil	.35

For complete list of features adaptable to our Universal Transits see page 92.

For prevailing prices see latest supplement.



No. 25
LIETZ "UNIVERSAL" ENGINEER'S Y-LEVEL

LIETZ UNIVERSAL Y LEVEL No. 25

Possesses a long center, star-shaped construction, clamp and tangent movements, a sensitive spirit level, 18-inch Achromatic Telescope with slide protector. Accurate, strong, and permanent in adjustments; Y with stop to maintain hairs in true position.

Dimensions and Weights

Length of telescope ..... 18 inches
Diameter of objective ..... 1⅜ "
Weight.....Instrument, 10¾ lbs.; tripod, 9 lbs.; box, 8 lbs.

No. 25 Lietz Universal Y Level, 18-inch, cross hairs to telescope. Equipped with screw coupling, split-leg tripod. Instrument complete with sunshade, dust brush, adjusting pins, etc., in neat polished mahogany case..... $110.00

LIETZ GRADUATED AND GROUND LEVEL VIALS

Prices of Level Vials Only, Without Housing

Level Vials for Telescopes of Precision Transits and Levels. Per inch of length (unmounted)	$1.00
Level Vials for Telescopes of Universal Transits and Levels. Per inch of length (unmounted)	.85
Level Vials for Plate and Standard of Precision Transits (unmounted)	1.50
Level Vials for Plate and Standard of Universal Transits (unmounted)	1.25
Circular Level Vial (as furnished with our Hydrographic Y Level)..	4.00

PLAIN LEVEL VIALS, NOT GRADUATED OR GROUND

Plain Level Vials, not graduated, 1 to 4 inches long, each.....	$0.50
Plain Level Vials, not graduated, 4½ to 6 inches long, each.....	1.00

Housing for Lietz Level Vials

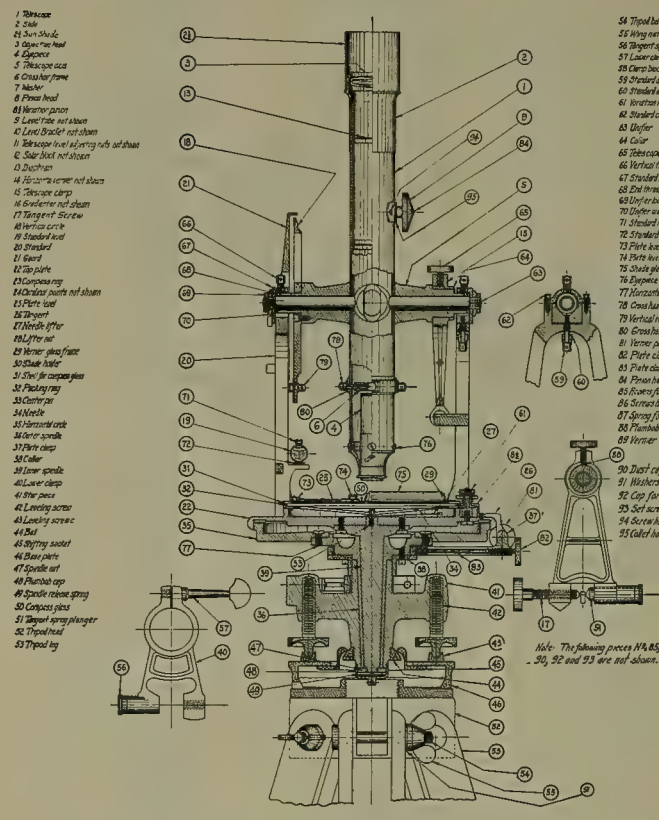
(Not including posts or nuts, etc.)

Housing for Telescope Levels for Mountain Transits.....	$1.75
Housing for Telescope Levels for large Engineers' Transits.....	2.25
Housing for Telescope Levels for Dumpy and Y Levels.....	3.00
Housing for Plate and Standard Levels for Transits.....	1.50
Housing for Plate and Standard Levels for Preliminary Transits..	1.00

For replacing broken level vials we suggest the sending of the housing for which the level vial is intended to insure proper size.
Extra for mounting any size..... $0.50

For prevailing prices see latest supplementary price list.

CROSS-SECTION OF LIETZ TRANSIT THEODOLITE No. 4 B



Correction

No. 29 should read shade holder instead of vernier glass frame.
No. 30 should read vernier glass frame instead of shade holder.

ADJUSTING PINS

Tempered steel adjusting pins for instrument adjustments, each	$0.10
Tempered steel adjusting pins, large size, for levels or emergency jaw of Lietz patent clutch coupling tripod head	.10
Phosphor bronze adjusting pins for setting off variation of the compass	.10
Pair of transit adjusting pins on small ring	.30

PARTS SUSCEPTIBLE TO LOSS OR INJURY

With Prices of Same

Kindly order by piece number, giving serial number of instrument, which is engraved in the compass box. It must be borne in mind that parts of Precision Instruments cannot be made interchangeable. Needed screws are best ordered by sending broken portions.

ALUMINUM PARTS. If parts are wanted made of our special aluminum alloy, kindly add the letter "A" to the piece number. Aluminum parts cost 15% more than those made of our bronze bell metal.

TELESCOPE

No.		
2½	Sunshade ..... No. 12, 75c; No. 9, 85c; No. 4,	$1.00
6	Crosshair frame	2.00
8	Pinion head focusing screw	1.50
*9	Level tube—See level vials, page 113.	
*11	Telescope level adjusting nuts	.25
*12	Solar block	.50
13	Diaphragm for controlling light in telescope	1.00
76	Eyepiece collar fastening screws	.25
78	Crosshair frame adjusting screws	.25
80	Crosshair frame washer	.25
84	Pinion head screw	.25
*90	Dust cap for object end of telescope	1.00
*92A	Cap for eyepiece with shutter	1.20
*92B	Cap for eyepiece without shutter	1.00
94	Screws holding collet to telescope	.25
95	Collet holding pinion head screw	1.00
*	Stirrup locking pin for Y level	.70

TELESCOPE AXIS

15	Telescope clamp complete with screws	$20.00
*16	Gradienter	10.00
17	Tangent screw to vertical motion	1.20
51	Tangent spring plunger	.25
56	Tangent spring cap to vertical clamp	.25
65	Telescope clamp screw	1.00
69	Unifier lock nut (for No. 4B and 4BC)	.25
*85	Acorns for end of telescope axis	.50
*87	Spring for vertical tangent motion	.20

VERTICAL CIRCLE AND STANDARDS

19	Standard level—See level vials, page 113.	
21	Guard to vertical circle	$5.00
59	Standard adjusting screws	.50
60	Standard adjusting screws	.25
62	Standard cap screws	.25
67	Standard bearing cap	$1.00
71	Standard level adjusting screws	.25
72	Standard level rocker	.25
79	Vertical vernier screws	.25
*86	Screws holding vertical circle guard	.25

COMPASS

8½	Variation pinion	$1.50
31	Shell for compass glass	1.00
34	Needle (including pivot)	5.00
50	Compass cover glass	1.00
61	Variation lock nut	.35

HORIZONTAL CIRCLE AND VERNIERS

25	Plate level—See level vials, page 113.	
26	Tangent piece complete with screws	$5.00
29	Vernier shade glass holder, per pair	.50
*30	Vernier glass frame	.25
37	Plate clamp piece	5.00
51	Tangent spring plunger	.25
56	Tangent spring cap to lower clamp	.25
73	Plate level adjusting nuts	.25
74	Plate level adjusting screws	.25
75	Vernier shade glass (send broken pieces or sketch)	.60
81	Vernier plate tangent screw	1.00
82	Plate clamp screw	1.20
*87	Spring for tangent motion	.20
*89	Vernier cover glass (send broken pieces or sketch)	1.00

LEVELING HEAD

40	Lower clamp complete	$5.00
42	Leveling screws	1.75
43	Leveling screw cups	.25
46	Base plate	4.50
47	Spindle nut	.50
48	Plumb-bob cap	.50
49	Spindle release spring	.25
57	Lower clamp thumb screw	1.20
*88	Plumb-bob hook and chain	.10
*93	Set screw holding ball to center	.10

For Tripod Head and parts see page 125.

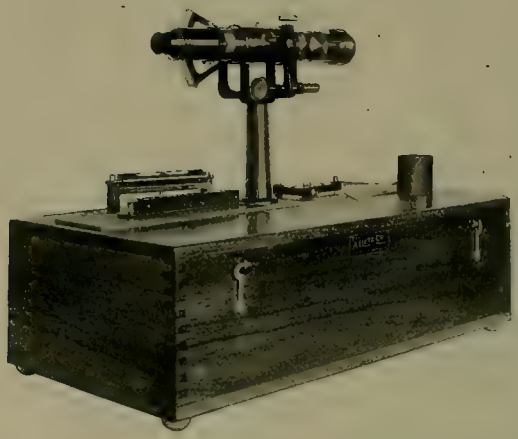
Parts marked * not shown in illustration.

SUNDRIES FOR TRANSITS AND LEVELS

New mahogany box with wooden fittings and strap, for transits	$7.50-12.00
New mahogany box with wooden fittings and strap, for levels	6.00-10.00
Extra lock and key for box	1.00
Extra key only	.25
Rubber bumpers for instrument boxes. Per set of four	.30
New strap for instrument boxes with screws and washers	1.00
Extra shipping box for transits or levels	1.00
Special box with cushion springs for carrying instruments in automobiles	3.00
Extra screw driver	.25
Extra spanner wrench for center of instrument	.50
Tapered wooden stick for cleaning centers	.30
Chamois skin for cleaning lenses, etc	.50
Camel hair dust brush	.40
Stiff brush for cleaning screw threads	.40

For prevailing prices see latest supplementary price list.

LIETZ PLANE TABLE OUTFITS



The advantages of the Plane Table for topographic surveying and mapping has brought this instrument into very popular favor, especially in our irrigation districts and oil fields.

A planchette or drawing board is mounted upon a specially constructed tripod head. The Johnson Movement consists of a socket with a flange to which the board is fastened. This socket is engaged and held by three segments in a manner to admit of the orientation of the planchette and also the clamping of it by means of a large milled head screw.

The Lietz Tangent Head Tripod (page 120) is an improved form. While it entails the additional investment it is self-evident that its nicety of adjustment and its control of the planchette is a labor-saving feature, it being constructed with the clamp and tangent in azimuth and the three screws for leveling.

We offer several forms or modifications of Alidades.

Our No. 30 represents a type as made for many years to meet the needs of the topographer, whereas No. 31 exemplifies the very latest form as adopted by the United States Geological Survey. Its improvement consists, briefly, of the telescope revolving 180 degrees on its longitudinal axis, thus admitting of an easy adjustment and control of the line of collimation, and the graduating of the vertical arc on the periphery for convenience in reading the angles, and its manner of numbered graduations. With the index of the vernier at 30 instead of 0 it can readily be understood that all the angles as read are positive, overcoming thereby almost all possibility of error in the notes.

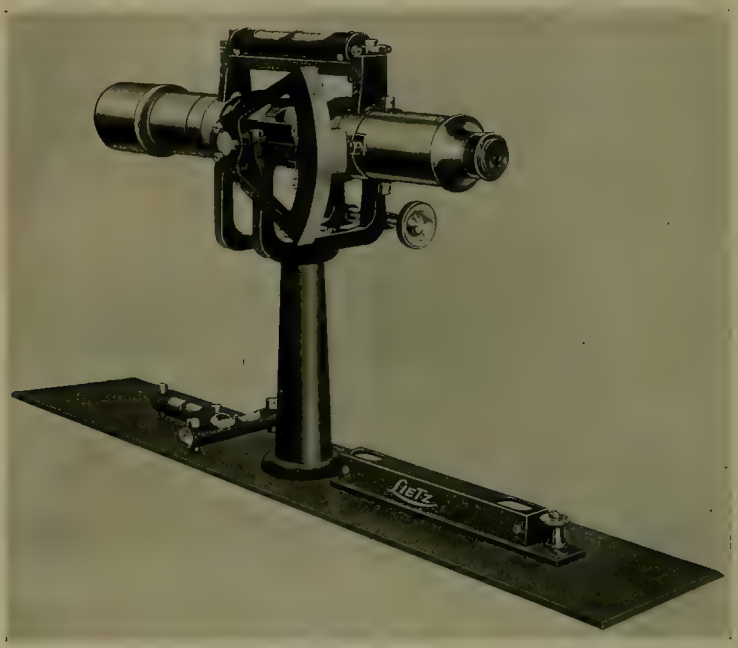
Our No. 32 is, again, a modification of our No. 31 and is after the model adopted by the Geological Department of the Stanford University. Its compactness and resultant portability brought us to the conclusion that it would, likewise, be appreciated by the members of the profession. Today they are in use in many of our States and especially in the oil districts of Oklahoma and Texas as well as in California.

LIETZ PLANE TABLE ALIDADE No. 30

No. 30 Alidade, with 11-inch Telescope, magnifying power 24 ×, sensitive ground glass level mounted securely to top of telescope. Fixed stadia hairs set 1:100; vertical circle 4½ inches, graduated on solid silver and with vernier reading to minutes. Instrument complete with sun shade, dust brush, adjusting pins, etc., in neat polished mahogany case $90.00

For prices of Tripods, Planchettes, etc., see pages 119 and 120.

For prevailing prices see latest supplement.



LIETZ ALIDADES Nos. 31 AND 32

Illustration of No. 32 with 34A

Illustration of Leather Case for No. 32LC

LIETZ PRECISION ALIDADES

United States Geological Survey Pattern

No. 31 Alidade with 11-inch telescope; magnifying power 24 diameters. Revolving telescope (180 degrees) to check cross hairs, edge graduation on 60-degree arc graduated on solid silver. Blade, beveled one side, 18 inches long, 3 inches wide, with two bubbles set at right angles, detachable striding level to telescope, clamp and tangent to vertical movement, fixed stadia hairs set 1:100, prism to eye-piece. Instrument complete with sunshade, dust cap, dust brush, adjusting pins, etc., in neat polished mahogany case. Price $118.00

No. 32 Stanford Geological Alidade, same as No. 31 but telescope 8½ inches, magnifying power 18 diameters, blade beveled one side, 14 inches long, 3 inches wide. Price..... 118.00

No. 32LC, same as No. 32 but contained in leather carrying case in lieu of mahogany case; carrying weight, 8½ lbs. Price..... 128.00

Extras for Plane Table Outfits

Kindly specify as needed

No. 34A Trough Compass, mounted on alidade, needle 3 inches.... $10.00
No. 34B Lietz Plane Table Movement (tangent), mounted on large split-leg tripod 55.00
No. 34C Johnson Plane Table Movement, mounted on large split-leg tripod 35.00
No. 34D One Extension Leg fitted in lieu of straight leg..... 3.50
No. 34E Full Extension Tripod fitted in lieu of straight leg..... 15.00
No. 34F Planchette or Drawing Board with holding-down thumb screws for paper and flange for mounting on tripod, size 24x31, weight 9 lbs. 5.00
No. 34G, same as No. 34F but Board 22x22, weight 5 lbs..... 4.25
No. 34H, same as No. 34F but Board 15x15, weight 3½ lbs..... 3.50
No. 34I Wooden Carrying Case, canvas covered, for Planchette 24x31 6.00
No. 34J Canvas Carrying Case, pliable, reinforced corners, for 24x31 2.50
No. 34K Canvas Carrying Case, pliable, reinforced corners, for 22x22 or 15x15 ..... 2.00
No. 34L Plumbing Arm and Plummet..... 4.00
No. 34M Fine Quality Drawing Paper, 24x31, single mounted sheet.. .75
No. 34N* Fine Quality Drawing Paper, 24x31, double mounted, muslin between, sheet 1.50
No. 34O Green Colored Drawing Paper, 24x31, single mounted..... .75
No. 34P* Green Colored Drawing Paper, 24x31, double mounted, muslin between, sheet 1.50
No. 34QM, same as No. 34M but 22x22 or 15x15..... .60
No. 34QN*, same as No. 34N but 22x22 or 15x15..... 1.20
No. 34QO, same as No. 34O but 22x22 or 15x15..... .60
No. 34QP*, same as 34P but 22x22 or 15x15..... 1.20
No. 34R Set of Rollers for carrying continuous paper on plane table 10.00
No. 34S New Clamp Screw to telescope of alidade..... .75

*Usable on both sides.

"The Plane Table and Its Use in Topographical Surveying." From the papers of the U. S. Coast Survey. 8vo. Cloth. Illustrated. N. Y., 1884 ..... $2.00

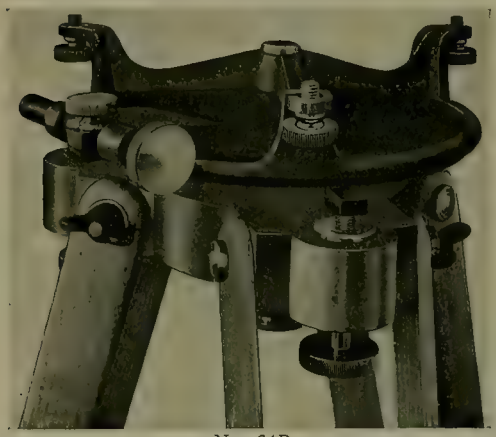
For prevailing prices see latest supplementary price list.

TROUGH COMPASS

No. 34A

No. 34A Lietz Trough Compass for Plane Table, 3-inch jeweled bar needle with stop $10.00

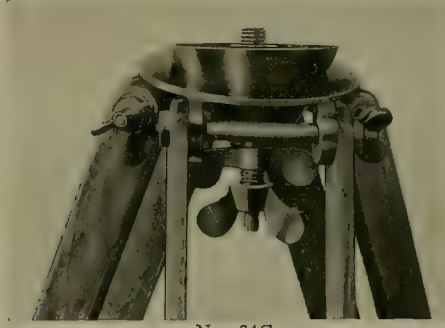
PLANE TABLE TRIPODS



No. 34B

No. 34B Lietz Tangent Head Tripod with straight legs and protection hood; weight with hood, 19 lbs..... $55.00

No. 34BE, same as No. 34B but fitted with extension legs; weight with hood, 23½ lbs..... 70.00



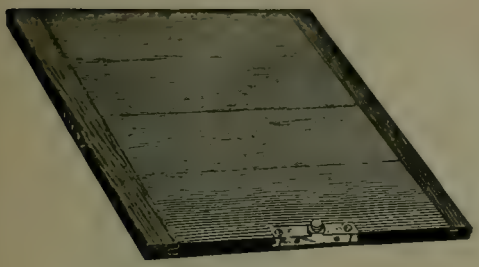
No. 34C

No. 34C Lietz Johnson Head Tripod with straight legs and protection hood; weight with hood, 11 lbs..... $35.00

No. 34CE, same as No. 34C but fitted with extension legs; weight with hood, 15½ lbs..... 50.00

For prevailing prices see latest supplementary price list.

LIETZ TRAVERSE TABLES



No. 35A

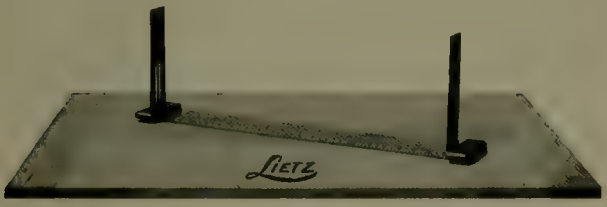
No. 36

No. 35 Lietz Traverse Table, very practical construction. First quality pinewood board 15x15 inches, fitted with Trough Compass No. 34A and equipped with thumb screws for holding down paper. Mounted on simple metal swiveling arrangement permitting orientation and clamping. With Lietz Extension Tripod No. 41, complete $25.00

No. 35A, same as No. 35 but pinewood board 22x22 inches..... 26.00

No. 36 Military Traverse Table. First quality pinewood board 15x15 inches, with slope scale reading 0° to 15° both ways, fitted with high quality bar needle compass, 1¼-inch countersunk in board. Metal flange for mounting on camera tripod. Complete with tripod 10.50

ALIDADES FOR TRAVERSE TABLES



No. 35½

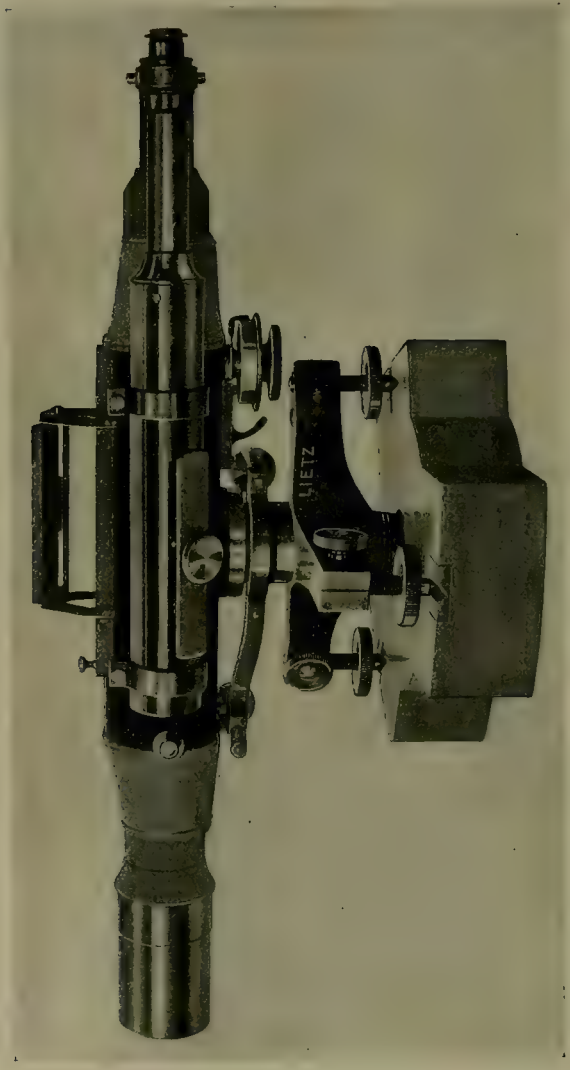
No. 35½ Alidade for Traverse Table, straight edge 1½x12 inches with one beveled edge graduated 40 parts to the inch. Folding fore and back sights, 3½ inches high in line with the graduated edge. In sewed leather case..... $15.00

No. 36½ Alidade for Traverse Table, simple form. Similar to No. 35½ but with fore sight only and sight not in line with graduated beveled edge. In sewed leather case 8.00

MILITARY ALIDADE

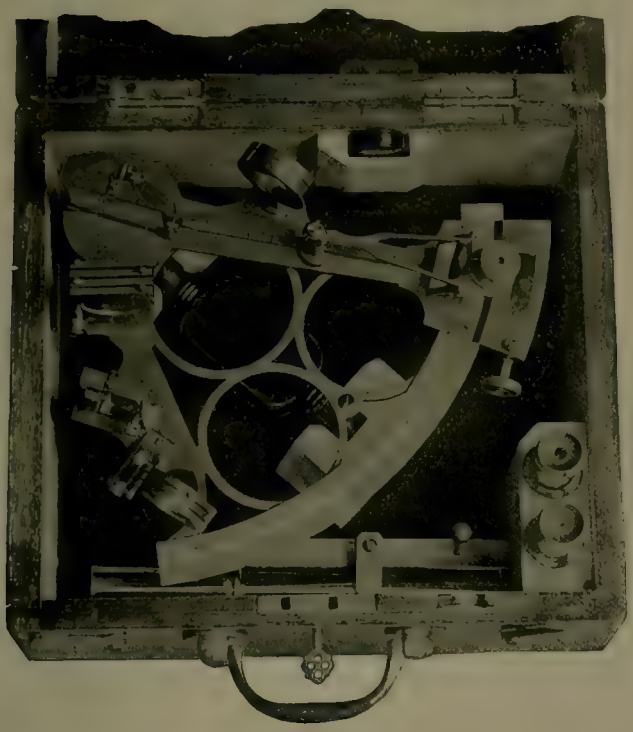
For Triangular Alidade, U. S. Army school design, see No. 2279 on page 397

For prevailing prices see latest supplementary price list.



LIETZ PRECISE LEVEL
Design of the U. S. Coast and Geodetic Survey
Price, $400.00
For prevailing prices see latest supplementary price list.

SEXTANTS, OCTANTS, ETC.



We carry an extensive line of Sextants, Octants, etc. If interested write for our Nautical Catalogue.

We have every facility for the repairing and regraduating of these instruments.

Separate parts carried in stock.

TRIPODS FOR LIETZ INSTRUMENTS

38 39 40

Made of selected ash, straight grained and well seasoned. Withstand unusual use.

Our extension tripods are very rigid and strong and move freely under all conditions of heat and cold. The double clamps employed are of one-piece cast brass and will not break under ordinary use. We furnish many tripods equipped with one extension leg, which admits of all the advantages of the extension tripods as regard set-ups, their only disadvantage being lack of portability.

We call special attention, however, to the greater steadiness and freedom from tremor in open windy country of our straight split-leg tripod No. 38 as furnished with our precision transits. In instruments of high power and sensitive levels it is the only tripod to be recommended. In use in cities and country it affords quick set-ups and easy carrying.

PRICE LIST OF TRIPODS FOR TRANSITS AND LEVELS

When ordering state for which instrument intended.

No. 38C Hardwood Tripod, split-leg pattern, clutch coupling	$15.00
No. 38S Hardwood Tripod, split-leg pattern, screw coupling	15.00
No. 38-3 Hardwood Tripod, split-leg pattern, arranged for the three-leveling-screw instruments, with instrument fastener	23.00
No. 38½C Half-Length Hardwood Tripod, split-leg pattern, clutch coupling, for mine use	13.00
No. 38½S Half-Length Hardwood Tripod, split-leg pattern, screw coupling, for mine use	13.00
No. 39C Extension Tripod, hardwood, clutch coupling	17.50
No. 39S Extension Tripod, hardwood, screw coupling	17.50
No. 39-3 Extension Tripod, hardwood, arranged for the three-leveling-screw instruments, with instrument fastener	25.50
No. 40 Hardwood Tripod, round pattern for builders' levels	10.00
No. 41 Extension Tripod, hardwood, for Preliminary Transit No. 22	10.00

Above tripods can be fitted to any make of instrument when baseplate (under the leveling screws) is furnished to us, or in conjunction with repairs to transits or levels.

SEPARATE LEGS FOR TRIPODS

No. 038 Separate or extra leg, split pattern, for tripods Nos. 38C to 38-3. Each	$3.50
No. 038½ Separate or extra leg, split pattern, for tripods Nos. 38½C and 38½S (half length). Each	2.75
No. 038S Set of three legs, split pattern, for tripods Nos. 38C to 38-3. Per set	10.00
No. 038½S Set of three legs, split pattern, for tripods Nos. 38½C and 38½S (half length). Per set	8.00
No. 039 Separate or extra extension leg for tripods Nos. 39C to 39-3. Each	4.50
No. 039S Set of three extension legs for tripods Nos. 39C to 39-3. Per set	12.50
No. 040 Separate or extra leg, round pattern, for tripod No. 40. Each	2.25
No. 040S Set of three legs, round pattern, for tripod No. 40. Per set	6.00
No. 041 Separate or extra extension leg for Preliminary Transit No. 22. Each	2.50
No. 041S Set of three extension legs for Preliminary Transit No. 22. Per set	7.00

Extras for Tripod Legs

Round or lower portion of extension tripod leg, with shoe	$1.25
Complete upper half of extension tripod log, consisting of two shells and two clamps	3.25
One side or shell only of upper half of extension tripod (no clamps or screws)	1.00
Extra clamp bands with wing bolt complete. Each	1.00
Extra wing bolt only for clamp band. Each	.25
Extra shoe for tripod leg, with screws to attach. Each	.35

TRIPOD HEAD

No. 45

Tripod head complete, with cap, bolts, nuts and washers	$5.00
Tripod head complete, with cap, bolts, nuts and washers for Preliminary Transit No. 22	3.50
Extra cap for tripod head. Each	.75
Extra bolt with wing nut and washer. Each	.90
Extra wing nut and washer for bolt of tripod head. Each	.35
Extra washer only for bolt of tripod head. Each	.05

CARRYING CASES FOR TRIPODS

Made of canvas with leather ends and shoulder strap.

Carrying Case for extension tripods Nos. 39C to 39-3 and straight leg tripods Nos. 38C to 38-3 and 40	$7.50
Carrying Case for preliminary extension tripod No. 41	6.50
Carrying Case for half-length tripods Nos. 38½C and 38½S	6.50

SURVEYORS' UMBRELLAS

No. 45 Well-made Umbrella, 5 feet in diameter, with extension staffs and iron shoe. Ribs with metal ring ends to which brace cords may be attached	$6.00

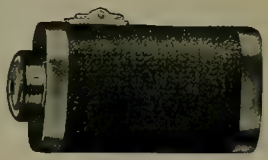
For tripods and Jacob's staff for compasses see page 134.

For leather scabbard or plumb bob holder which may be attached to tripod leg see No. 516, page 185.

For prevailing prices see latest supplementary price list.

EVEREADY DAYLOS

No. 50



No. 52

No. 54-55

No. 56-57

No. 50	Fountain Pen Light, clip contact, black enamel	$1.00
No. 50A	Tungsten Battery No. 706 (renewals)	.25
No. 50B	Mazda Lamp No. 1179 (renewals)	.15
No. 52	Coat Pocket Light, 1x2¾x3½ inches, cloth covered	1.00
No. 52A	Tungsten Battery No. 703 (renewals)	.40
No. 52B	Mazda Bulb, 3.8 volts, No. 1190 (renewals)	.15
No. 53	Vest Pocket Light, 1x1⅞x3½ inches, cloth covered	1.00
No. 53A	Tungsten Battery No. 792 (renewals)	.30
No. 53B	Mazda Bulb No. 1182 (renewals)	.15
No. 54	Tubular Light, large lens and reflector, 1½x6½, vulcanized fiber	1.50
No. 54A	Tungsten Battery No. 790 (renewals)	.30
No. 54B	Mazda Bulb No. 1198 (renewals)	.15
No. 55	Same as No. 54 but larger, 1½x11 inches	2.25
No. 55A	Tungsten Battery No. 711 (renewals)	.45
No. 55B	Mazda Bulb No. 1199 (renewals)	.15
No. 56	Tubular Light, 1¼x5 inches, vulcanized fiber	1.00
No. 56A	Tungsten Battery No. 791 (renewals)	.30
No. 56B	Mazda Bulb No. 1182 (renewals)	.15
No. 57	Tubular Light, 1½x6½ inches, vulcanized fiber	1.20
No. 57A	Tungsten Battery No. 790 (renewals)	.30
No. 57B	Mazda Bulb No. 1198 (renewals)	.15

No. 61

No. 63-64

LAMPS

No. 60	Lamp for illuminating graduations, cross-wires, etc., for use in underground work, common	$4.00
No. 61	Lamp of brass, with ground lens	7.00
No. 63	Small Plummet Lamp of brass, steel point, 16 oz	8.00
No. 64	Large Plummet Lamp of brass, steel point, 24 oz	10.00

For prevailing prices see latest supplementary price list.

POCKET MAGNIFYING GLASSES

Suitable for Reading Verniers, etc.

No. 70A

No. 71

No. 75

No. 70—1-inch Single Lens, hard rubber, oval, magnification 4.0×..	$ .50
No. 70A—1¼-inch Single Lens, hard rubber, oval, magnification 3.5×	.60
No. 70B—1½-inch Single Lens, hard rubber, oval, magnification 3.0×	.75
No. 71—1¼-inch Double Lens, hard rubber, oval, magnification 3.5-7×	1.00
No. 72—1¼-inch Single Lens, white celluloid, oval, magnification 3.5×	.75
No. 73—1¼-inch Double Lens, white celluloid, oval, magnification 3.5-7×	1.10
No. 74—1-inch Single Lens, hard rubber, bellows shape, magnification 4.0×	.60
No. 75—1¼-inch Single Lens, metal mounting, bellows shape, magnification 3.5×	1.00
No. 76—1¼-inch Double Lens, metal mounting, bellows shape, magnification 3-6×	1.75

See also Pocket Amoptoscopes Nos. 98 and 99 on page 128.

POCKET MAGNIFYING GLASSES

For Ore and Cloth Inspection, etc.

No. 80

No. 81

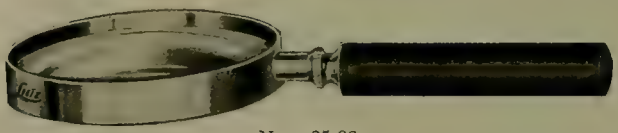
No. 84

No. 77 Lietz Special Mining Loupe, 1⅜-inch diameter, nickel plated folding frame, magnification 4.5×	$1.50
No. 78 Coddington Lens, ½-inch diameter, nickel plated folding frame, magnification 20×	1.50
No. 79 Coddington Lens, ¾-inch diameter, nickel plated folding frame, magnification 10×	2.00
No. 80 Coddington Lens, 1-inch diameter, nickel plated folding frame, magnification 5×	2.50
No. 81 Thread Counter, brass frame, ½-inch field	.50
No. 82 Thread Counter, brass frame, nickel plated, ½-inch field	.60
No. 83, Thread Counter, brass frame, nickel plated, 1-inch field	2.00
No. 84, Magnifier on three legs, brass, screw adjustment, 1-inch diameter, magnification 7.5×	.60

For prevailing prices see latest supplementary price list.

MAGNIFYING OR READING GLASSES

Reading Glasses Nos. 85 to 92 are of the best quality material and workmanship. The lenses are double convex, accurately ground from clear white glass and highly polished, mounted in German silver rim, with ebonized handle.



Nos. 85-92

No. 85—2	inches diameter	$1.00	No. 89—4	inches diameter	$2.00
No. 86—2½	inches diameter	1.25	No. 90—4½	inches diameter	2.50
No. 87—3	inches diameter	1.50	No. 91—5	inches diameter	3.00
No. 88—3½	inches diameter	1.75	No. 92—6	inches diameter	4.00

MAGNIFYING AMOPTOSCOPES

In Leather Cases

Amoptoscopes are a new style of reading glass of the finest finish, workmanship and design. The lenses are of fine quality white glass fitted in narrow nickeled frames.

Nos. 95-96

No. 95—2 inches diameter, in seal grain leather case..... $1.25
No. 96—3 inches diameter, in seal grain leather case..... 1.50

POCKET AMOPTOSCOPES

Pocket Amoptoscopes are the same as Nos. 95-96 but are fitted with a folding handle.

No. 98—1¼ inches diameter, in seal grain leather case..... $1.15
No. 99—2 inches diameter, in seal grain leather case..... 1.35

For prevailing prices see latest supplementary price list.

DIMINISHING OR REDUCING GLASSES

Reducing Glasses consist of double concave lenses. Used by artists, engravers, etc., to reduce, optically, drawings, photographs and other illustrations.

Nos. 104-105

No. 100 Reducing Glasses, round, rough edges, unmounted, 1½ inches in diameter $0.35
No. 101 Reducing Glasses, round, ground edges, unmounted, 2 inches in diameter ..... .50
No. 102 Reducing Glasses, in hard rubber case like Nos. 70-71 Magnifying Glasses, 1¼ inches in diameter..... 1.00
No. 103 Reducing Glasses, like No. 102 but 1½ inches in diameter.. 1.25
No. 104 Reducing Glasses, in German silver rim with ebonized handle, 2 inches in diameter 1.25
No. 105 Reducing Glasses, like No. 104 but 3 inches in diameter..... 2.00

READING GLASS HOLDERS

No. 107 No. 108

No. 107 Reading Glass Holder, metal base 3⅞ inches in diameter, 6¾ inches high. The lens arm is of one piece with spring clamp end, which will hold any lens not over 1½ inches in diameter. Vertical and lateral adjustments..... $3.00
No. 107A, same as No. 107, but with socket end in place of the spring clamp end, to accommodate Reading Glasses Nos. 85-92 or Reducing Glasses Nos. 104-105, after removing the ebonized handle 4.00
No. 108 Reading Glass Holder, metal base 4¾ inches in diameter, round metal pillar measuring 3⅜ inches to the top. The lens arm is in three parts, with three joints, attached to a triangular post by a strong joint with broad bearing surface. The spring clamp will hold lenses not exceeding 1½ inches in diameter. Adjustment is by rack and pinion..... 9.00
No. 108A, same as No. 108, but with socket end in place of the spring clamp end, to accommodate Reading Glasses Nos. 85-92 or Reducing Glasses Nos. 104-105, after removing the ebonized handle 10.00

For prevailing prices see latest supplementary price list.

GODWIN'S PORTABLE HELIOGRAPH

As made by us for the U. S. Forest Service.

Illustration "A"

Illustration "B"

No. 110

No. 110 Godwin's Improved Portable Heliograph. The improvement of the Godwin type lies principally in that it necessitates the need of but one tripod, whereas in most other forms two are necessary.

Illustration "A" shows the outfit in use with the two mirrors, which are required in order to get the reflected sunlight if the sun is in the rear of the operator. Illustration "B" shows the outfit as it is mostly used when the sun can be reflected directly to the station to be signaled.

Instrument consists of two mirrors, 3¼x3¼ inches, adjustable vertically and horizontally by micrometer movements, a shutter 4½x4½ inches, a sighting rod, and one tripod 24 inches high. Instrument fits neatly in two chamois-lined trays, contained in leather case with shoulder strap. Weight of entire outfit 7 lbs. Price of outfit complete with instructions and code $50.00

For prevailing prices see latest supplementary price list.

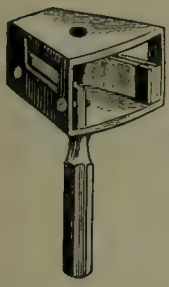
PRISMATIC RANGE FINDER

No. 112

No. 112 Prismatic Range Finder. After sighting an object, the distance to which is to be measured, the shutter is shifted, either left or right (depending on the convenience of pacing distance). The distance walked along the base line until the same object is again brought into view multiplied by a constant of 50 will determine the distance sought. In leather case with directions $10.00

ANGLE MIRRORS, PRISMS AND CROSS-STAFF HEADS

No. 115



No. 116

No. 117

No. 118

No. 120

No. 115 Angle Mirror, with small plumb bob for angles of 90 degrees. The handle can be detached and stored in frame of instrument. Size of instrument 3¾x1¾ inches, each.... $7.50

No. 116 Angle Mirror, plain, for angles of 90 degrees, in morocco case, each 5.00

No. 117 Rectangular Prism, for angles of 90 degrees. Size of instrument 2½x1¼x⅝ inches, in morocco case, each..... 5.00

No. 118 Double Prism to take angles of 90 and 45 degrees, in morocco case, each 10.00

No. 119 Cross-Staff Head with magnetic compass 3 inch, needle 1¾ inch, divided to 2 degrees on raised ring, each..... 5.00

No. 120 Cross-Staff Head, octagonal socket for Jacob's staff, in case, 2½ inches, each 3.00

MAPS

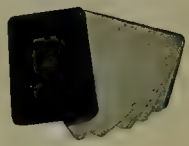
We carry at all times a complete line of the U. S. Geological Survey Topographic Maps (send for index), also various County and Road Maps, as well as the Coast charts published by the U. S. Coast Survey and the U. S. Hydrographic Office.

For prevailing prices see latest supplementary price list.

TALLY REGISTERS

No. 126A

No. 127A



No. 129

Hand Tally Registers Nos. 126-128, for keeping count by pressing on a knob, are of first-class workmanship and will not get out of order. The cases are nickel-plated and they are arranged with a zero-setting device.

No. 126A Hand Tally Register, capacity 1 to 1,000	$2.50
No. 126B Hand Tally Register, capacity 1 to 10,000	3.50
No. 127A Hand Tally Register with Safety Pin, capacity 1 to 1,000	3.00
No. 127B Hand Tally Register with Safety Pin, capacity 1 to 10,000	4.00

DOUBLE TALLY REGISTER

No. 128 Lietz Special Combined Tally Register, consisting of two No. 126A Registers joined as one, for tallying various timbers, etc., at one time	6.50

CELLULOID FIELD BOOKS OR CRUISERS' PADS

As used by woodsmen for tallying timber.

Cruisers' Pads contain six sheets of heavy white, opaque celluloid, dull finish, with strong leather covers. Will take pencil and erasures instantly. Not affected by rain. (For erasing we recommend our No. 3890 Cerise Erasers.)

No. 129A Cruisers' Pad, 4x6 inches, each	$1.50
No. 129B Cruisers' Pad, 5x6 inches, each	2.00

TIMBER SCRIBES

No. 130

No. 130 Timber Scribe, wooden handle (size 6½ inches), each	$1.25
No. 131 Timber Scribe, wooden handle (size 5 inches), each	1.00

For prevailing prices see latest supplementary price list.

NOTE—For special Circumference Tapes see page 204.
For Township Plats see page 226.
For Topographical Paper see page 228.

PEDOMETERS AND PASSOMETERS

No. 132

No. 132A

No. 137

PEDOMETERS

No. 132 Pedometer, registers distance walked up to 10 miles by each one-quarter mile $1.25

No. 132A Pedometer, registers distance walked up to 100 miles by each one-quarter mile 1.50

The hands on above can be set backward or forward as desired by removing back of case and turning set screw.

No. 133 Pedometer, registers distance walked up to 12 miles by each one-quarter mile, with resetting device..... 4.50

No. 134 Pedometer, registers distance walked up to 100 miles by each 80 yards, with resetting device..... 5.00

No. 135 Pedometer, registers distance walked up to 100 miles by each one-quarter mile, with resetting device..... 6.25

No. 136 Pedometer, small size for ladies, 1¼ inches, registers 100 miles by single miles, gunmetal case..... 6.50

PASSOMETERS

No. 137 Passometer, or step-counter, registers to 25,000 steps, with stem resetting device 6.00

No. 138 Passometer, or step-counter, registers to 100,000 steps with stem resetting device 6.50

Prices on Odometers on request.

For prevailing prices see latest supplementary price list.

SURVEYING COMPASSES

No. 140

No. 144A

No. 140 Surveying Compass, with folding sights, graduated to ½ degrees on raised ring, variation plate, two level bubbles, ball joint and socket for Jacob's staff mountings, needle 3½ inches long, in polished mahogany case, each	$16.00
No. 141, same as No. 140, but with 4½-inch needle, each	18.00
No. 140A, same as No. 140, but without variation plate, each	14.00
No. 141A, same as No. 141, but without variation plate, each	16.00
No. 142 Surveying Compass, like No. 140, but without variation plate and without level bubbles, 3-inch needle, each	10.00
No. 142A, same as No. 142, but with 3½-inch needle, each	11.50
No. 142B, same as No. 142, but with 4-inch needle, each	13.00

Extra Parts for Surveying Compasses

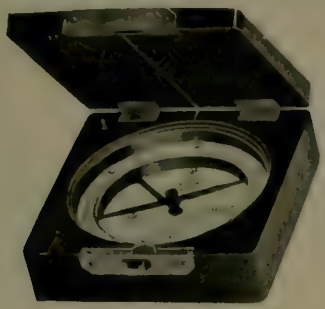
No. 144A Leather Case for Surveying Compass, with shoulder strap	$4.00
No. 144B, if in lieu of mahogany box	2.50
No. 144C Ball and Socket for Surveying Compass	3.50
No. 144D Needle for Surveying Compass (including pivot)	5.00

Jacob's Staffs and Tripods for Compasses

No. 146 Jacob's Staff, 5 feet, iron shoe	$1.00
No. 147 Tripod with Jacob's staff top for compasses	3.00
No. 148 Tripod with Brass staff top for compasses	5.00

For prevailing prices see latest supplementary price list.

CRUISERS' BOX COMPASSES



Nos. 150-151

No. 150 Box Compass, 3x3 inches, with hinged cover with sight line, 2-inch needle, graduated on raised metal ring from 0-360.. $3.50

No. 150A, same as No. 150 but graduated in quadrants..... 3.50

No. 151 Box Compass, 3¾x3¾ inches, with hinged cover with sight line, 2½-inch needle, graduated on raised metal ring from 0-360 ..... 4.50

No. 151A, same as No. 151 but graduated in quadrants..... 4.50

MINERS' COMPASS OR DIPPING NEEDLE

No. 153

No. 154

No. 153 Miners' Compass or Dipping Needle, with 3-inch dip needle, in velvet-lined case $12.00

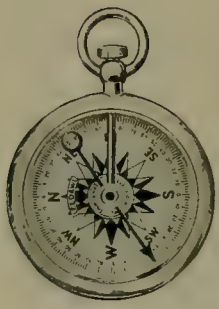
No. 154, same as No. 153, but Norwegian pattern, needle gimbaled, in velvet-lined case 14.00

For prevailing prices see latest supplementary price list.

POCKET COMPASSES

Selected with special care to meet the needs of our patrons.

WATCH PATTERN COMPASSES



No. 156

No. 158

No. 159

No. 156 Pocket Compass, white metal, open-face case, flat, jeweled needle 1¼ in. long, silvered metal dial. Needle stop in crown.. $1.25
No. 157, same as No. 156, but Hunting case. Self-acting needle stop 2.00
No. 158 Pocket Compass, white metal, open-face case, jeweled bar needle 1¼ in. long, white enameled dial. Needle stop in crown.. 1.75
No. 159, same as No. 158, but Hunting case. Self-acting needle stop.. 2.50
No. 159G, same as No. 159, but in gold-filled Hunting case..... 5.00
No. 160 Pocket Compass, white metal, open-face case. Dial 1¼ in., is of aluminum and floats instead of being fixed enabling one to note all magnetic bearings at once, jeweled center. Stop in crown. 1.75
No. 161, same as No. 160, but Hunting case. Self-acting stop..... 2.50
No. 161G, same as No. 161, but in gold-filled Hunting case..... 5.00

For Compasses with Illuminated Dial see next page.

PULL-OFF COVER COMPASSES

No. 162

No. 162 Pocket Compass, brass case, select quality, pull-off cover, raised ring, jeweled needle with self-acting stop, 2 in. diameter.. $2.25
No. 163, same as No. 162, but 2⅜ in. diameter..... 2.50

Will you need a Pedometer? See page 133.

For prevailing prices see latest supplementary price list.

POCKET COMPASSES

COMPASSES WITH ILLUMINATED DIAL FOR NIGHT READING

No. 165

No. 164 Pocket Compass, white metal open-face case, floating aluminum dial 1¼ in., similar to our No. 160 Compass but the "N" and "S" points of the dial are treated with a permanently luminous compound which enables one to read direction at night. Jeweled center, stop in crown.. $2.25

No. 165, same as No. 164, but Hunting case. Self-acting needle stop. 3.50

No. 165G, same as No. 165, but in gold-filled Hunting case..... 6.50

No. 166

No. 166 Pocket Compass, white metal Hunting case, floating aluminum dial 1¼ in. finished half black, half white. The letters "N," "E," "S" and "W" are treated with a permanent luminous compound, and "NE," "SE," "SW" and "NW" are indicated by permanently luminous points. Jeweled center, self-acting stop..... 4.50

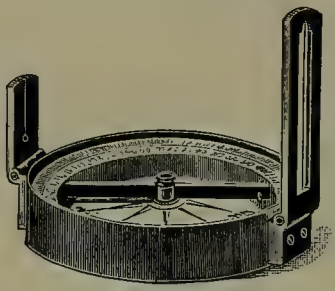
SIGHT COMPASSES

No. 167

No. 167 Pocket Sight Compass, Watch Pattern, with folding sights. Jeweled needle, self-acting stop, 1¾ in..... $4.25
No. 167A, same as No. 167 but needle 2 in..... 4.75
No. 167B, same as No. 167 but needle 2⅜ in..... 5.25
No. 168 Pocket Sight Compass, same as No. 167B with Clinometer; 2 in. only 6.50

For prevailing prices see latest supplementary price list.

POCKET COMPASSES WITH SIGHTS

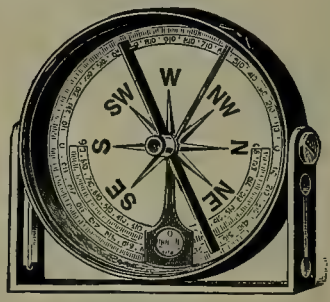


No. 169

No. 169 Bronzed Pocket Compass, pull-off cover, folding sights, edge bar, jeweled needle, with stop. Graduations on raised ring; 2½ in. $5.25
No. 169A, same as No. 169, but 3 in..... 6.25

CLINOMETER COMPASSES

No. 170



No. 172

No. 170 Clinometer Compass, nickel case, flat jeweled needle 2 in. long, with stop. Graduated on raised ring to single degrees. Pull-out lever which serves to rest the instrument on base when used as a clinometer $5.00
No. 172 Clinometer Compass, bronzed, bar needle jeweled, with stop. Sights arranged to fold down to serve as base when used as clinometer. In leather case. Needle 2½ in..... 7.25
No. 172A, same as No. 172 but needle 3 in..... 8.75
No. 172B, same as No. 172 but needle 4 in..... 10.50

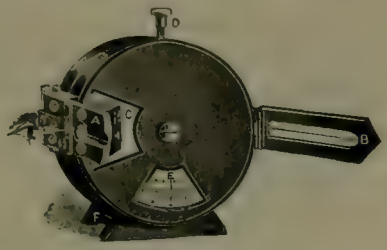
For prevailing prices see latest supplementary price list.

REPAIRS TO COMPASSES, ETC.

Our factory is equipped to repair compasses of all kinds, and furnish necessary parts on short notice.

PRISMATIC COMPASSES

No. 175



No. 176

No. 175 Hutchinson's Improved Prismatic Compass, folding sight, prism arranged to fold back. Angles are read at the same instant the object is sighted. In leather case. Floating card dial, 2 in. $11.00

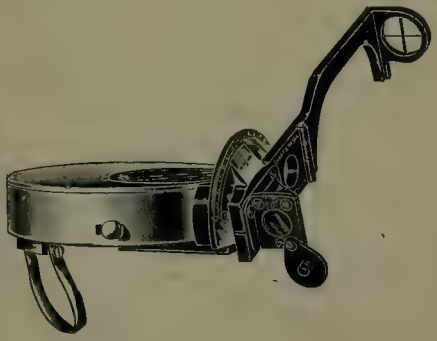
No. 175A, same as No. 175 but dial 3 in. 16.00

No. 176 Prismatic Compass and Clinometer, 3-in. floating compass, jeweled center, gravity clinometer, giving inches per yard and degrees. Socket attachment and with leather sling case..... 26.00

No. 176½, same as No. 176, but aluminum ring compass. Socket attachment and in leather sling case..... 34.00

THE VERSCHOYLE POCKET TRANSIT

In Aluminum Case



No. 180 The Verschoyle Pocket Transit combines the useful features of the Abney Level, Prismatic Compass and Clinometer. Only one observation is necessary to obtain both the magnetic bearing and the vertical angle of any distant point. Length of needle, 2¾ in. Price in leather sling case $35.00

No. 181, same as No. 180, but with angle piece and collapsible metal tripod, ball and socket fitting..... 44.00

We invite your attention to our Preliminary Transit No. 22.

For prevailing prices see latest supplementary price list.

BRUNTON POCKET TRANSIT

Showing Brunton Transit on Ball and Socket Tripod Head No. 185C

No. 183

No. 183 Brunton Pocket Transit, graduated 0-360 ..... $25.00
No. 183A Brunton Pocket Transit, graduated in quadrants 25.00
No. 183B Brunton Pocket Transit, graduated in mils instead of degrees, for army use 25.00

BRUNTON TRANSITS WITH ILLUMINATED DIAL

Especially adapted for night or underground work.

These instruments are similar to Nos. 183-183B, but are furnished with a graduated cover glass treated with a permanent luminuous compound. The ends of the needle and the sights are likewise illuminated. The illuminated features do not interfere with the use of the instrument for accurate work in the daylight.

No. 184 Brunton Pocket Transit with illuminated dial on cover glass, illuminated needle and sights. Graduated 0-360 ..... $32.00
No. 184A, same as No. 184 but graduated in quadrants 32.00
No. 184B, same as No. 184 but graduated in mils instead of degrees, for army use 32.00

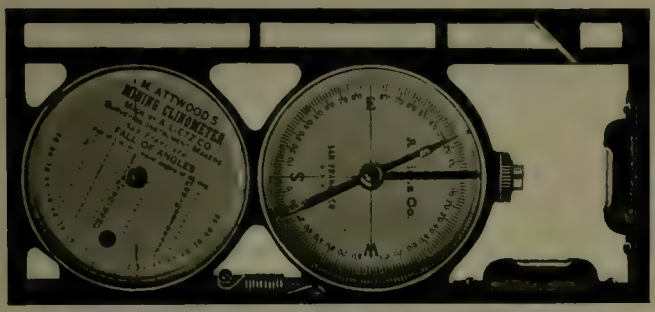
Note—Illuminated dials on cover glass are graduated to 10 degrees or 200 mils only, respectively, as the luminuous compound cannot practically be used for finer graduations.

ACCESSORIES FOR BRUNTON POCKET TRANSITS

No. 185A Leather case for Brunton Transit, with belt strap only $2.00
No. 185B Leather case for Brunton Transit, with sling strap 2.50
No. 185C Ball and Socket Tripod Head for Brunton Transit 5.00
No. 185D Collapsible Metal Tripod for Brunton Transit 3.50
No. 185E Level Bubble for Brunton Transit, loose ..... .25
No. 185F New Mirror for Brunton Transit 1.00
No. 185G New Cover Glass for Brunton Transit ..... .30

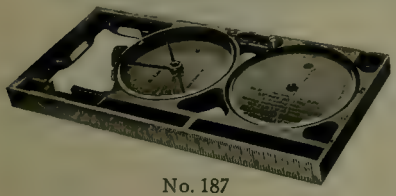
For prevailing prices see latest supplementary price list.

ATTWOOD'S MINING CLINOMETER AND COMPASS



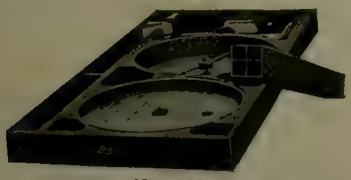
No. 186

No. 186 Attwood's Mining Clinometer, as made by us, is a universal measuring tool, combining a most sensitive clinometer, a compass, a hand level, and a horizontal and vertical contact level. The frame is cast of our special hard aluminum alloy and is 6¼ inches long and 3 inches wide, and 7/16 of an inch thick. The compass is 2⅛ inches in diameter and is graduated to two degrees, numbered every ten degrees, in quadrants. The needle is of the bar type and has a jeweled center and is equipped with a stop. The gravity clinometer is 2⅛ inches in diameter and is graduated to single degrees numbered every ten degrees from 0 to 90 reading both ways, and is equipped with a stop. An improved prism is attached to one of the long sides of the frame which serves to reflect the bubble to the eye-end of the sight when the instrument is used as a hand level. Weight of instrument in genuine leather case eight ounces.
Price $15.00



No. 187

No. 187, same as No. 186, but with graduations to the edges, which serve as a protractor; graduations to single degrees, also a scale 20 and 25 parts to the inch. In genuine leather case..... $22.50



No. 188

No. 188, same as No. 186, but with an adjustable sight telescope used to determine horizontal angles of objects not on a horizontal plane. In genuine leather case 18.00

For prevailing prices see latest supplementary price list.

LIETZ HAND LEVELS AND CLINOMETERS

No. 190

No. 189 Lietz Special Hand Level, 5-inch, in sewed leather case..... $10.00
Finely finished and constructed, nickel plated, with prism and magnifying lens to bubble, and drawout eye-piece.
No. 190 Lock's Hand Level, 5-inch, bronze finish, in leather case.... 7.00
No. 191 Extra leather case for Nos. 189 and 190..... .75

No. 192

No. 192 Square type combination hand and bench level, 5-inch, in leather case $4.50
No. 193 Extra leather case for No. 192..... .60

No. 195

No. 195 Abney's model Combined Hand Level, Clinometer and Slope Measurer, 5-inch, arc graduated to degrees 0-90 in both directions with vernier reading to 5 minutes. Also a slope scale 1:1 to 1:10 reading each way. In leather case..... $13.50
No. 195A, same as No. 195 but with arc graduated to degrees and with a per cent scale from 1 to 100%. U. S. Forest Service pattern. In leather case 15.00
No. 196 Extra leather case for Nos. 195 and 195A..... 2.50

EXTRA PARTS FOR HAND LEVELS

No. 197A Object Glass ..... $ .25
No. 197B Eye-piece Glass ..... .25
No. 197C Prism 1.75
No. 197D Half-lens 1.00
No. 197E Level bubble, unmounted..... .25

See Stevens' Combination Slope Rule, page 416.

For prevailing prices see latest supplementary price list.

ANEROID BAROMETERS

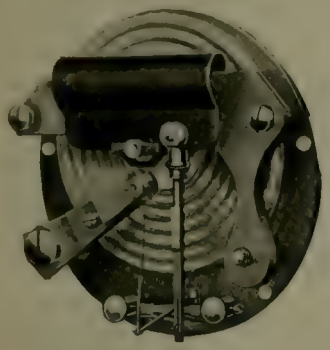
In connection with our line of Barometers, Barographs, Thermographs, etc., we desire to call attention to the importance of selecting such articles. We aim to carry only the most reputable makes of these instruments.

With our factory facilities and years of experience we are in a position to offer our patrons the accommodation of testing each individual instrument under pressure and in connection with a standard mercurial barometer, thus assuring our friends of that satisfaction seldom enjoyed when purchasing through other sources.

DESCRIPTION

The Aneroid, owing to its portable form and great sensitiveness in responding to changes in pressure of the atmosphere (it will denote a change much quicker than the Mercurial Barometer), is today in more general use by observers of meteorological changes than any other form of Barometer.

In measuring altitudes, owing to its portability, sensitiveness and the ease with which approximate results may be obtained, it is highly valuable to the Engineer and Surveyor, while the Tourist, with the Aneroid, notes his gain in elevation foot by foot, as well as plans his excursions in accordance with prognostications from its readings.



The illustration shows the general construction of the movement with its elastic metallic box, called the vacuum chamber.

This chamber is constructed with two circular discs of thin corrugated German silver, firmly soldered together at the edges, forming a close box. The air is exhausted from this box which causes the top and bottom discs to close together.

The vacuum chamber is firmly fixed to the circular metal base by a post upon its centre, projecting through the base plate.

An iron bridge spans the chamber, resting upon the base plate by means of the two pointed screws. (These screws are used to finely regulate the tension upon the chamber.)

To the bridge is fixed the mainspring, which is forced down by mechanical means sufficient to insert a knife edge piece.

As this knife edge is fastened (by means of a central pillar) to the top disc of the chamber the mainspring, when released, lifts the upper part of the chamber, drawing the two discs apart.

As this forms a perfect balance (the power of the mainspring opposing the atmospheric pressure upon the vacuum chamber), any variation in air-pressure will now be shown by a movement up or down of the elastic chamber. A decrease in pressure will allow the mainspring to overcome the power of the vacuum, the action then being upwards, and an increase of air pressure will produce the contrary result.

BOOKS ON THE BAROMETER

"The Aneroid Barometer—Its Construction and Use," by George W. Plympton, A. M., C. E. ..... $ .50

"The Barometer as the Foot Rule of the Air," by P. R. Jameson, F. R. Met. Soc. ..... .10

FIRST QUALITY WATCH FORM ANEROID BAROMETERS

No. 200

No. 201E

No. 200 **Gilt Case, open face,** 1¾-in. silvered metal dial with altitude scale 3000 feet in 10-foot divisions. Compensated for temperature. In velvet-lined morocco case..... $21.35

No. 200A, same as No. 200, but 5000 feet. Altitude scale in 20-foot divisions. In velvet-lined morocco case..... 20.00

No. 200B, same as No. 200, but 6000 feet. Altitude scale in 20-foot divisions. In velvet-lined morocco case..... 21.25

No. 200C, same as No. 200, but 8000 feet. Altitude scale in 50-foot divisions. In velvet-lined morocco case..... 19.25

No. 200D, same as No. 200, but 10,000 feet. Altitude scale in 100-foot divisions. In velvet-lined morocco case..... 20.00

No. 200E, same as No. 200, but 12,000 feet. Altitude scale in 100-foot divisions. In velvet-lined morocco case..... 21.00

No. 201 **Gilt Hunting Case,** 1¾-in. silvered metal dial with altitude scale 3000 feet in 10-foot divisions. Compensated for temperature 23.35

No. 201A, same as No. 201, but 5000 feet. Altitude scale in 20-foot divisions 22.00

No. 201B, same as No. 201, but 6000 feet. Altitude scale in 20-foot divisions 23.25

No. 201C, same as No. 201, but 8000 feet. Altitude scale in 50-foot divisions 21.25

No. 201D, same as No. 201, but 10,000 feet. Altitude scale in 100-foot divisions 22.00

No. 201E, same as No. 201, but 12,000 feet. Altitude scale in 100-foot divisions 23.00

SECOND QUALITY WATCH FORM ANEROID BAROMETERS

No. 202, same pattern as No. 200, compensated for temperature, silvered metal dial, with altitude scale to 8000 feet in 100-foot divisions..... $13.50

THIRD QUALITY WATCH FORM ANEROID BAROMETERS

No. 203, same pattern as No. 200, not compensated, silvered metal dial, with altitude scale to 8000 feet in 100-foot divisions..... 9.00

For prevailing prices see latest supplementary price list.

POCKET SIZE ANEROIDS

Best Quality

Showing Pocket Aneroid No. 205A in Lietz Special Leather Case No. 206D, as adopted by timber cruisers.

This is a most suitable instrument for the engineer and timber cruiser and for all reconnaissance purposes.

No. 205 **Pocket Size Aneroid,** 2½ inches, gilt case. Compensated for temperature, silvered metal dial with altitude scale 3000 ft. in 10-ft. divisions, in velvet-lined morocco case..... $22.60

No. 205A, same as No. 205 but 5000 ft. altitude scale in 20-ft. divisions, in velvet-lined morocco case..... 21.25

No. 205B, same as No. 205 but 6000 ft. altitude scale in 20-ft. divisions, in velvet-lined morocco case..... 22.50

No. 205C, same as No. 205 but 8000 ft. altitude scale in 50-ft. divisions, in velvet-lined morocco case..... 20.50

No. 205D, same as No. 205 but 10,000 ft. altitude scale in 50-ft. divisions, in velvet-lined morocco case..... 21.25

No. 205E, same as No. 205 but 12,000 ft. altitude scale in 50-ft. divisions 22.25

No. 205F, same as No. 205 but 16,000 ft. altitude scale in 100-ft. divisions 23.25

No. 205G, same as No. 205 but 20,000 ft. altitude scale in 100-ft. divisions 25.50

No. 206 Leather Sling Case for No. 205-205G, in lieu of morocco... 2.50

No. 206A Extra Leather Sling Case for No. 205-205G..... 3.50

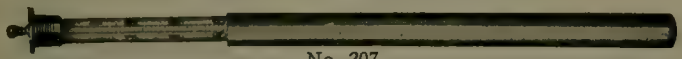
No. 206B Extra Morocco Case for No. 205-205G..... 1.50

No. 206C Extra Pigskin Case for No. 205-205G..... 2.75

No. 206D Lietz Special Leather Case for No. 205-205G, as adopted by timber cruisers. If in lieu of the morocco..... .75

If extra 1.50

POCKET THERMOMETERS



No. 207

No. 207 Pocket Thermometer, 5-inch glass cylinder, porcelain scale, hard rubber or nickel screw case, mercury tube approximate scale range 20 to 130 degrees F..... $1.00

For other Pocket Thermometers see page 162.

SPECIAL SURVEYING ANEROID BAROMETERS

No. 210

No. 210—3" Stout bronzed metal case, silvered metal dial, with vernier scale moved by rack-work motion, reading lens arranged to traverse the entire circle, altitude scale arranged for mining purposes 4000 feet ascent, 2000 feet descent, compensated for temperature. In leather sling case..... $63.00

No. 210A, same as No. 210, but aluminum case. In leather sling case 68.00

No. 211, same as No. 210, but altitude scale 6000 feet. In leather sling case 63.00

No. 211A, same as No. 211, but aluminum case. In leather sling case 68.00

For higher Altitude Scales order by letter—D, E or F.

D—10,000 feet altitude..... $2.75
E—12,000 feet altitude..... 4.50
F—16,000 feet altitude..... 6.50

PORTABLE SURVEYING ANEROID

No. 212

No. 212 **Pocket Aneroid,** 2½-inch silvered metal dial, fixed altitude scale, 5000 feet, in single 5-foot divisions, in repeating circle of divisions, making it possible to read even closer than 5 feet. Compensated for temperature. In pigskin case, each..... $60.00

NOTE.—Pocket Aneroid No. 212 can also be supplied in Lietz Special Timber Cruisers' Case. See No. 206D, page 145.

AEROPLANE AND AUTO INSTRUMENTS

No. 215A

No. 215 Aviation Altitude Barometer, movement compensated for temperature. Mechanism mounted in grey enamel aluminum case, with flange at front. Revolving dial with altitude scale, divided in equal divisions, which permits of the zero being set to the point of the hand without fear of inaccurate readings, as would be the case if the dial divisions were unequal spaces. Movement constructed to withstand vibration.

Order Altitude by the following letters:

No. 215A— 7,000 feet altitude.

No. 215B—10,000 feet altitude.

No. 215C—12,000 feet altitude.

No. 215D—15,000 feet altitude.

Price, each $80.00

No. 216 Aviation Altitude Barometer, same as No. 215, but has an inner dial of Radio-active compound and a hand of the same material. By use of this combination the altitude can be readily noted at night time, when operating without lights. Mention altitude required when ordering.

Price, each 110.00

No. 217 Aeroplane Compass.

Prices on application.

No. 217

AVIATION INCLINOMETER

No. 218

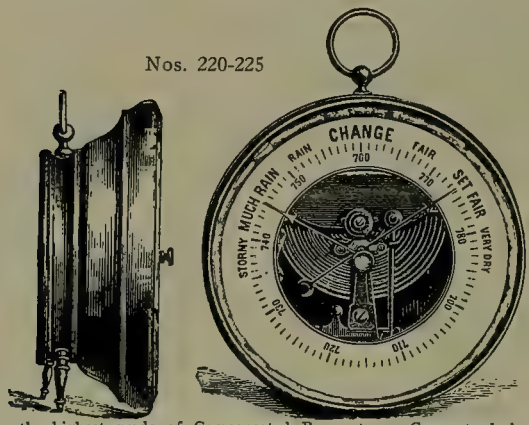
No. 218 Aviation Inclinometer, a sensitive but very necessary instrument on an aeroplane. Used in measuring the angle of slope of an aircraft, referred to the horizontal. The casing is made of aluminum and across the top is mounted a curved glass tube filled with red liquid. Divisions on the front of plate read to 10 degrees in each direction. These instruments are usually fitted in pairs, one ahead of the pilot and one to the side.

Price, each $11.00

For prevailing prices see latest supplementary price list.

BRASS CASE BAROMETERS

Nos. 220-225



We offer the highest grade of Compensated Barometers. Guaranteed dependable, each instrument being tested before delivery under our Standard Vacuum Air Pump, with the mercurial standard. Made with open-face dial and brass case, highly polished and lacquered.

No. 220— 3 -inch face, each	$5.00
No. 221— 4 -inch face, each	7.50
No. 222— 5 -inch face, each	10.00
No. 223— 6½-inch face, each	12.50
No. 224— 8 -inch face, each	15.00
No. 225—10 -inch face, each	20.00
No. 223G—6½-inch face, with graduations on glass, exposing full works, brass case, each	13.50

WALL FLANGE BAROMETERS (Brass Case)

Nos. 226-228

These Barometers are of the same high grade as our Nos. 220-225 line, but differ from them in that they are screwed to the wall through a flange.

No. 226—5 -inch face, each	$10.00
No. 227—6½-inch face, each	12.50
No. 228—8 -inch face, each	15.00
No. 227W—6½-inch face, carved hardwood back instead of brass	8.50
No. 230 Direction Charts for reading Barometers	.25

For prevailing prices see latest supplementary price list.

BAROGRAPHS, THERMOGRAPHS, HYGROGRAPHS, ETC.

Self-recording instruments are required where a continuous record is sought. They naturally assure of greater reliability of readings than when taken by the individual from instruments that have to be read at stated periods. Used mostly for engineering reconnaissance and by aero students.

POCKET ALTITUDE BAROGRAPHS

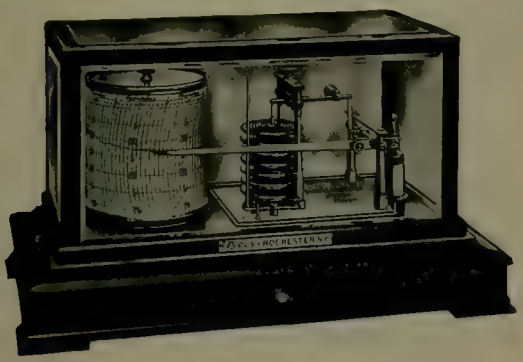
No. 235 Pocket Barograph, size 4¾x3¾x1⅜; weight about 1 lb. Metal, morocco covered case, with glass insert to read chart. Charts ruled to represent time in half hours for 24 hours and the pressure in feet of altitude. The pen makes contact every two minutes. This instrument also records atmospheric changes. We furnish with the instrument 50 graduated charts and one bottle of barograph ink.

No. 235A Reading to 4,000 feet altitude. Price complete..... $66.00
No. 235B Reading to 7,800 feet altitude. Price complete..... 60.00
No. 235C Reading to 15,000 feet altitude. Price complete..... 60.00

Extras for Pocket Barographs

No. 236 Extra Charts per set of 50..... $2.00
No. 237 Extra Bottle Barograph Ink..... .45
No. 238 Extra Leather Carrying Case..... 3.50

RECORDING BAROMETERS
(Barographs)



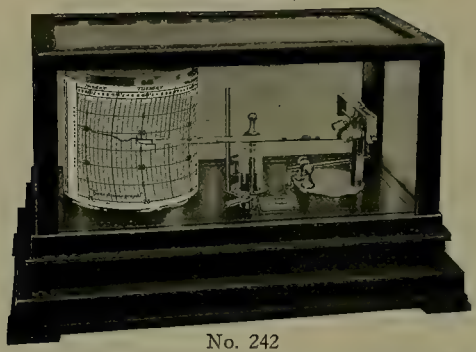
No. 240

No. 240 Highest Grade Recording Barometer, with front opening drawer with two divisions for holding used and unused charts. Weekly charts recording air pressure from 28 to 30.5 inches by 20ths of inches. Seven vacuum boxes, eight-day clock movement, jeweled. Complete with charts for one year and bottle of barograph ink $63.00

For extra charts, ink and parts see bottom of page 151.

For prevailing prices see latest supplementary price list.

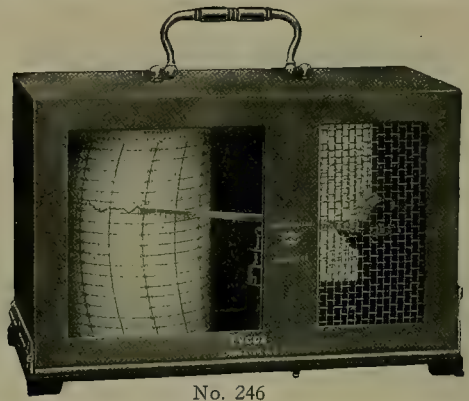
RECORDING BAROMETERS
(Barographs)



No. 242

No. 242 Recording Barometer, simplified form. This type of instrument has recently been patented. The recording pen is operated by a large vacuum chamber concealed in the base of the instrument. High-grade clock movement, jeweled, running eight days. Weekly charts recording air pressure from 28 to 30.5 inches by 20ths of inch. Complete with charts for one year and bottle of barograph ink.. $40.00

RECORDING THERMOMETER (Thermograph)



No. 246

No. 244 Thermograph, in metal, weather-proof case with handle and glass front. Eight-day jeweled clock movement. Charts recording temperature from 0 to 100 degrees Fahrenheit by 2 degrees. Complete with charts for one year and bottle of recording ink $50.00
No. 244A, same as No. 244 but in oak case..... 45.00
No. 245 Thermograph, similar to No. 244 but charts ranging from 20 to 120 degrees Fahrenheit 50.00
No. 245A, same as No. 245 but in oak case..... 45.00
No. 246 Thermograph similar to No. 244 but with high drum. Charts recording temperature from 62 degrees below to 128 degrees above zero, Fahrenheit. Complete with charts for one year and bottle of recording ink..... 50.00

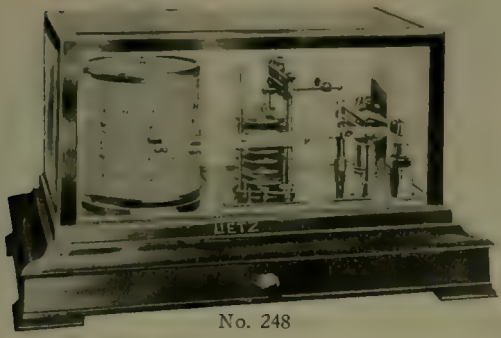
Write us if interested in other forms of recording thermometers or pyrometers.

For prevailing prices see latest supplementary price list.

The highest known average monthly temperature ever observed is that of 102 degrees F. for July at Death Valley, California. The lowest is —60 degrees F. for January at Werchojansk, Siberia. "Weather and Weather Instruments." Stiffened cover 50c. Cloth cover $1.00.

RECORDING BAROMETER AND THERMOMETER

(Baro-Thermograph)



No. 248

No. 248 Baro-Thermograph. With this instrument it is possible to take both barometer and thermometer records on one chart. The range of the barometer is from 28 to 31 inches, while the thermometer shows a range of 0 to 120 degrees Fahrenheit in 2 degree lines. Two different colored inks are used, blue for the barometer and green for the thermometer, so that no confusion will arise in reading the two records. This instrument has eight vacuum boxes, all working parts exposed. Complete with charts for one year, pens and barograph inks, two colors..... $88.00

RECORDING HYGROMETER

(Hygrograph)

No 249. Hygrograph. This instrument records the moisture by single per cent from 1 to 100 per cent. The recording pen responds to the expansion and contraction of a quantity of fine hair affected by the variations of humidity. In weather-proof metal case, supplied with charts for one year and one bottle of recording ink $60.00

Extra Charts for Recording Instruments

(Set of Charts consists of one year's supply)

	Per set.
No. 2 Charts for Barograph Nos. 240 and 242, recording from 28 to 31 inches.....	$2.00
No. 6 Charts for Barograph Nos. 240 and 242, recording from 25 to 31 inches.....	2.00
Charts for Barograph in the metric system to order.	
No. 37 Charts for Thermograph No. 244, recording from 0 to 100 degrees F.	2.00
No. 38 Charts for Thermograph No. 244, recording from 20 to 120 degrees F.	2.00
No. 39 Charts for Thermograph No. 244, recording from —30 to +110 degrees F.	2.00
No. 46 Charts for Thermograph No. 246, recording from —62 to +128 degrees F.	2.50
No. 20 Charts for Baro-Thermograpn No. 248, recording 28 to 31 inches and 0 to 120 degrees F. in 2 degree lines	2.50
No. 249A Charts for Hygrograph No. 249.....	2.50

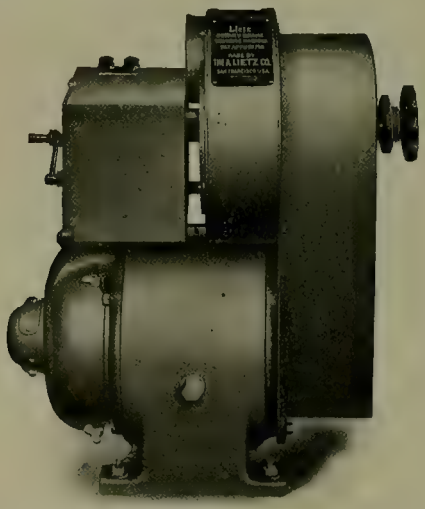
ACCESSORIES FOR RECORDING INSTRUMENTS

No. 250A Extra Pens, ordinary	$0.70
No. 250B Extra Pens, V pattern	1.25
No. 250C Recording Ink, plain bottle	.45
No. 250D Recording Ink, stoppered bottle.....	.75
No. 250E Gimbal Hook for suspending barograph from ceiling on board ship.....	6.00

For prevailing prices see latest supplementary price list.

NAUTICAL DEPARTMENT

The above illustrates the outfit as extensively furnished by us to the United States Shipping Board, Emergency Fleet Corporation. It consists of Standard Binnacle, with compass illuminated from below and with azimuth instrument, Wheel-house Compass and After Compass, Hand Sounding Machine with accessories, Lietz Pelorus with brass stand and yoke, also Lifeboat Compasses.



Lietz Rotary Brake, Electric Driven Sounding Machines are extensively used by the United States Navy Department and are to be found aboard the larger off-shore vessels. Absolute satisfaction has been the result of their installation.

NAUTICAL EQUIPMENT

Parties interested in Nautical equipment should send for our complete Nautical Catalog, in which we list and price:

Lietz Standard Compensating Binnacle and Compass No. 3000A

Standard Compasses and Binnacles.
Wheelhouse Compasses and Binnacles.
Liquid (spirit) Compasses.
Lifeboat Compasses.
Azimuth Instruments.
Pelorus Instruments and Stands.
Azimuth Mirrors.
Ships' Clinometers.
Electric Sounding Machines.
Hand Sounding Machines.
Depth Recorders.
Sounding Weights.
Sounding Wire.
Parallel Rules.
Chart Dividers.
Chart Weights.
Sextants and Octants.
Marine Binoculars and Telescopes.
Ships'Logs, Rotators and Governors.
Chronometers and Marine Clocks.
Seawater Thermometers.
Hygrometers.
Ships' Hold Thermometers.
Mercurial Barometers.
Weather Barometers, etc.

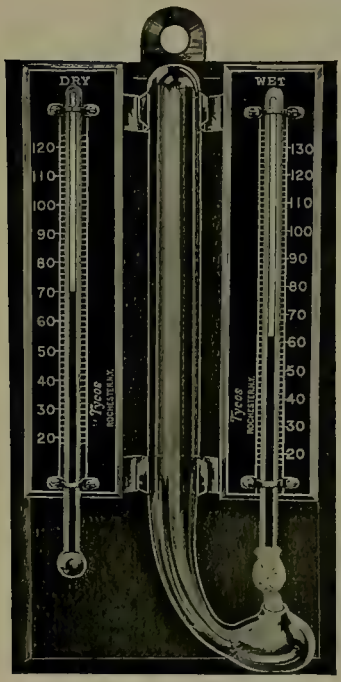
For years we have devoted a great deal of attention to this branch of our business, and we are justly proud of the position we have attained in this field of endeavor.

We hold the distinction of having equipped any number of our modern merchantmen and vessels of our Navy, as well as many of our coastwise bottoms.

We invite your correspondence if interested in these lines, and desire to mention that we have every facility for the adjusting and repairing of Nautical Instruments.

A complete line of Charts and Publications of the United States Coast and Geodetic Survey and the United States Hydrographic Office carried in stock.

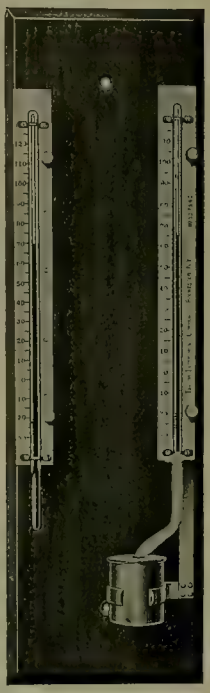
HYGROMETERS



No. 252

For determining the relative and absolute humidity and dewpoint and foretelling frosts in connection with tables and charts as furnished with the instrument

HUMIDITY
Its effect on our health and comfort. Paper, 5x8, 10c



No. 254

No. 252 **Mason's Hygrometer** (wet and dry bulb), magnifying mercury tubes, black oxidized brass scales, white-filled figures and graduations, insulating brass supports, mahogany finish board, size 8½x4½ inches. Approximate scale range 10 to 120 degrees. Complete with U. S. Government tables $4.50

No. 254 **Standard Weather Bureau Pattern Hygrometer** (wet and dry bulb), magnifying mercury tubes engraved to single degrees, with porcelain strips at side on which are marked the figures and every fifth degree line of the scale, oxidized brass plates, insulating brass supports with binding screws, nickeled cistern and silk wick, mounted on mahogany finish board, size 17x15 inches. Approximate scale range 10 to 40 degrees below zero to 120 degrees F. above. Complete with two certificates 11.00

No. 255, same as No. 254 but scale range 70 degrees below zero 13.50

No. 256, same as No. 254 but scale range 80 degrees below zero 14.35

ACCESSORIES FOR HYGROMETERS

No. 252A Extra Thermometer (wet or dry) for No. 252 ..... $1.75

No. 252B Extra Glass Bulbs for No. 252 ..... .35

No. 252C Extra Glass Bulbs for No. 252, 2 inches long (used horizontally) ..... .25

No. 252D Extra Silk Wicks for No. 252 ..... .10

No. 254A Extra Weather Bureau Pattern Thermometer (wet or dry), with certificate, for No. 254 ..... $5.00

No. 255A Extra Weather Bureau Pattern Thermometer (wet or dry), with certificate, for No. 255 ..... 6.25

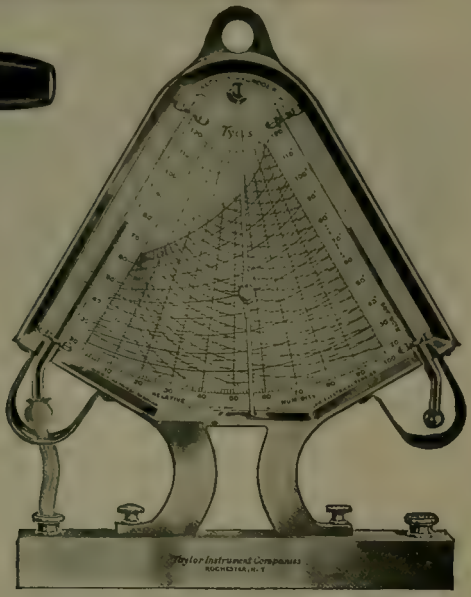
No. 256A Extra Weather Bureau Pattern Thermometer (wet or dry), with certificate, for No. 256 ..... 6.35

For prevailing prices see latest supplementary price list.

HYGRODEIKS AND PSYCHROMETERS

No. 256

Sling Psychrometer and Protecting Case



No. 259-260 Hygrodeik (Hanging Form)

The Sling Psychrometer illustrated herewith is a modification of the pattern developed by the U. S. Weather Bureau. The advantage of this form of wet and dry bulb Hygrometer over the stationary form is the facility with which tests can be made quickly and the accuracy of the readings obtained, as in whirling the bulbs they are subjected to perfect circulation.

No. 256 **Sling Psychrometer** $9.00
With 12-inch engraved stem thermometers graduated 0 to 100 degrees Fahrenheit in ½ degrees.

No. 257 **Pocket Sling Psychrometer** 10.50
Seven inches long with chain sling, 5-inch engraved stem thermometers graduated 0 to 100 degrees Fahrenheit in 1 degree, with leather carrying case.

No. 256A Extra engraved thermometer for No. 256 3.00

No. 257A Extra engraved thermometer for No. 257 3.00
With each instrument we supply copy of U. S. Weather Bureau tables and directions for determining humidity, etc.

No. 259 **Hygrodeik** (Hanging Form) 15.00
Frame of polished brass, chart engraved on German silver. Range of scales 20 to 120 degrees Fahrenheit, in 1-degree graduations.

No. 260 **Hygrodeik**, same as No. 259 but with range of scales 80 to 180 degrees in 1-degree graduations 15.00
Nos. 259 and 260 can be furnished with engraved thermometers graduated in centigrade if so specified on order.

No. 259A Extra engraved thermometer for No. 259..... 2.50

No. 260A Extra engraved thermometer for No. 260..... 2.50

No. 261 **Lambrecht's Polymeter** 10.00
A simplified form of Hygrometer for the home. Mounted on a neat metal frame, showing percentage of humidity on dial about three inches and with thermometer above.

STANDARD MAXIMUM AND MINIMUM THERMOMETERS

Self-registering

No. 265

No. 265 Standard Weather Bureau Pattern Maximum and Minimum Set with certificates, engraved stems, magnifying tubes with porcelain strip on side on which are marked the figures and every fifth degree line of the scale, cylindrical bulbs, oxidized brass plates, insulating brass supports with binding screws, mounted on mahogany finish board, size 17x5 inches. Scale range 10 to 40 degrees below zero for the maximum tube and 20 to 60 degrees below for the minimum tube to 120 degrees F. above. Complete in wooden packing box..... $12.00

No. 266 Extra Standard Weather Bureau Pattern Maximum Thermometer only (like No. 265) with insulating support and without board. Scale range 10 to 40 degrees below zero to 120 degrees F. above, with certificate..... 6.00

No. 267 Extra Standard Weather Bureau Pattern Minimum Thermometer only (like No. 265) with insulating support and without board. Scale range 20 to 60 degrees below zero to 120 degrees F. above, with certificate..... 5.50

No. 268 Standard Weather Bureau Pattern Thermometer, not self-registering, similar to No. 265, with insulating support and without board. Scale range 10 to 40 degrees below zero to 120 degrees F. above, with certificate..... 5.00

No. 270

No. 270 Maximum and Minimum Thermometer, golden oak back, each tube mounted on separate plate attached at one end with a thumb screw so that the thermometers may be reset. Scale range 10 to 40 degrees below zero for the maximum tube and 20 to 60 degrees below for the minimum tube to 120 degrees F. above. Magnifying tubes and black oxidized brass scales. Price complete $4.00

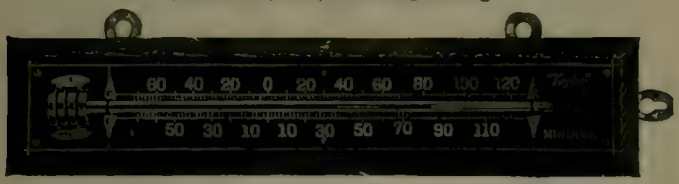
No. 271 Extra Maximum Scales with tubes for No. 270..... 2.00

No. 272 Extra Minimum Scales with tubes for No. 270..... 1.75

For prevailing prices see latest supplementary price list.

MINIMUM THERMOMETER

(Medium grade) Self-registering



No. 274

No. 274 Minimum Thermometer, magnifying mercury tube, golden oak back, black oxidized brass scale, white-filled figures and graduations. Scale range 20 to 60 degrees below zero to 120 degrees F. above; 8-inch $1.00

No. 275, same as No. 274 but 10-inch..... 1.25

No. 276

CYLINDRICAL MAXIMUM AND MINIMUM THERMOMETERS

Self-registering. Six's Pattern

No. 276 Maximum and Minimum Registering Thermometer, mounted in heavy cylindrical brass case, fitted with chain and rubber bumper to lessen the danger of breakage by concussion. Particularly useful for obtaining the temperature of stored coal, etc., in the hulls of vessels or for the taking of temperature in inaccessible places such as a manhole or pipe. Size 12x1⅝ inches. Approximate scale range 30 to 220 degrees F..... $11.25

No. 276A Extra Glass Tube for No. 276 Maximum and Minimum Thermometer..... 3.50

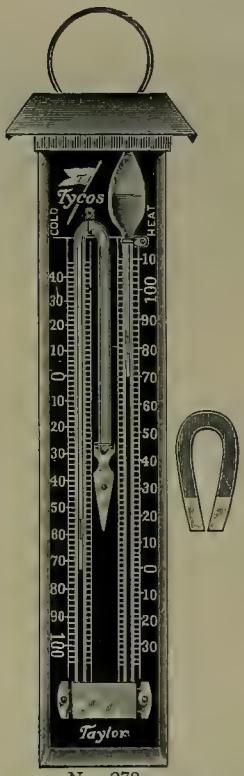
BOOKS ON WEATHER AND TEMPERATURE

"Weather and Weather Instruments," 164 pages with illustrations. Written in the simple and unscientific language of the layman. Contains chapters on fog, clouds, the weather map, frost, dew, snow, rain, cyclones, barometers, humidity, thermometers, etc.
Cloth cover, per copy, $1.00; paper cover..... .50

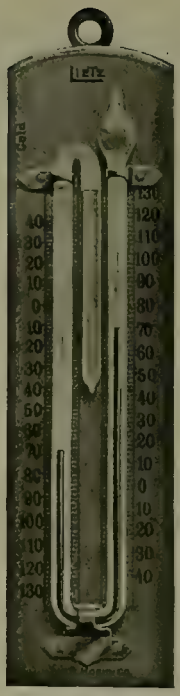
The Thermometer and its family tree, paper, 5x8.. .10

For prevailing prices see latest supplementary price list.

SELF-REGISTERING THERMOMETERS



No. 278



No. 280

No. 278 Standard Grade Six's Pattern Maximum and Minimum Self-Registering Thermometer, black oxidized brass scales, white-filled figures and graduations, black japanned tin case. Approximate scale range 10 to 40 degrees below zero to 120 degrees F. above, 8-inch $3.50

No. 279, same as No. 278 but 10-inch 4.00

No. 278C, same as No. 278 but mounted in copper case instead of japanned case, 8-inch 4.00

No. 279C, same as No. 279 but mounted in copper case instead of japanned case, 10-inch 4.75

No. 280 Common Grade Self-Registering Thermometer, boxwood, black filled figures, polished on all sides. Scale range 10 to 40 degrees below zero to 120 degrees F. above, 10-inch..... 1.50

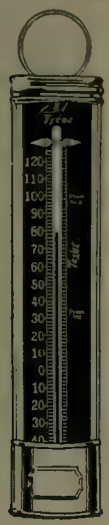
Frost Alarm Thermometers.

If interested in Frost Alarm Thermometer systems write us for special circular.

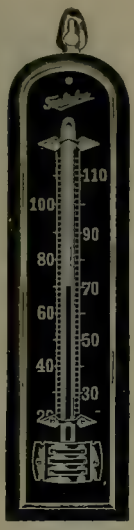
For prevailing prices see latest supplementary price list.

THERMOMETERS

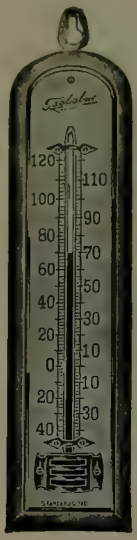
We list a representative line of strictly high-grade Thermometers, and assure utmost satisfaction as regards the efficiency and dependability of these instruments.



No. 282-283



No. 284-285



No. 286

No. 282 Copper Case Thermometer, standard grade, magnifying mercury tube, oxidized brass scale, white-filled figures and graduations, brass screw clasps. Scale range 10 to 40 degrees below zero to 120 degrees F. above, 10-inch $1.75

No. 283, same as No. 282 but 12-inch 2.25

No. 282½ Copper Case Thermometer, similar to No. 282 but scale range 0 to 220 degrees F., 10-inch 1.75

No. 283½ Copper Case Thermometer, similar to No. 282 but scale range 0 to 220 degrees F., 12-inch 2.25

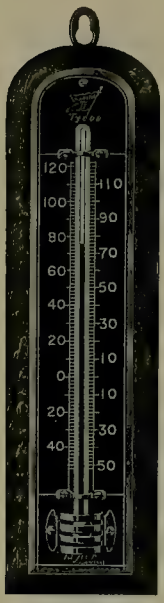
No. 284 Cabinet Thermometer, standard grade, magnifying mercury tube, black metal scale with silver engravings, bronze screw clasp and guard, mounted on neat wooden back with rounded edges, finished in mahogany or Circassian walnut. Approximate scale range 10 to 110 degrees or 30 to 120 degrees F., 6-inch 1.75

No. 285, same as No. 284 but 8-inch 2.00

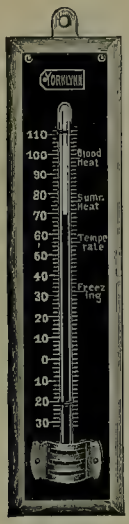
No. 286 Cabinet Thermometer, standard grade, magnifying mercury tube, gilt scale with gold trimmings, black figures and graduations, mounted on concave-beveled wooden back, Mission Flemish or weathered oak finish. Approximate scale range 0 to 110 degrees or 30 to 120 degrees F., 8-inch 1.50

For prevailing prices see latest supplementary price list.

THERMOMETERS



No. 288-290



No. 291-292

No. 294-295

No. 288 Cabinet Thermometer, standard grade, magnifying mercury tube, black oxidized brass bevel-edged scales, white-filled figures and graduations, bronze screw clasp and guard, finished in golden and weathered oak. Approximate scale range 10 to 40 degrees below zero to 120 degrees F. above, 8-inch $1.25

No. 289, same as No. 288 but 10-inch 1.50

No. 290, same as No. 288 but 12-inch 2.25

No. 291 Cabinet Thermometer, standard grade, magnifying mercury tube, black metal scale with white-filled figures and graduations, bronze screw clasp and guard, maple wood back, polished. Approximate scale range 40 degrees below zero to 110 degrees above, or 10 degrees below to 130 degrees above zero F., 8-inch ..... .55

No. 292, same as No. 291 but 10-inch ..... .75

No. 294 Cabinet Thermometer, common grade, magnifying mercury tube, black oxidized brass scale, white-filled figures and graduations, nickeled straps and guard, wooden black, walnut or birch finish. Approximate scale range 10 to 40 degrees below zero to 120 degrees F. above, 8-inch..... .25

No. 295, same as No. 294 but 10-inch ..... .50

For prevailing prices see latest supplementary price list.

ENGRAVED STEM CHEMICAL THERMOMETERS

Ordinary Grade

Plain mercury tubes ¼-inch diameter, each in a turned wood box.

	Length	Scale	Approximate scale range	Sub-division	Each
No. 300A	12″	Fahrenheit,	—20° to 120°	2°	$1.00
No. 300B	12″	Fahrenheit,	10° to 220°	2°	1.00
No. 300C	12″	Fahrenheit,	30° to 300°	2°	1.25
No. 300D	14″	Fahrenheit,	30° to 400°	2°	1.65
No. 300E	16″	Fahrenheit,	30° to 650°	2°	2.00
No. 301A	12″	Centigrade,	—10° to 110°	1°	1.00
No. 301B	12″	Centigrade,	0° to 150°	1°	1.25
No. 301C	14″	Centigrade,	0° to 200°	1°	1.65
No. 301D	16″	Centigrade,	0° to 350°	1°	2.00

ARMORED ENGRAVED STEM THERMOMETERS

For 3-inch Immersion

For all purposes requiring the use of Engraved Stem Thermometers we recommend, wherever practical, the armored type. The lessened liability to breakage in use will be found to more than compensate for the added cost.

	Length	Scale	Scale Range	Subdivision	Each
No. 305A	12″	Fahrenheit,	—20° to 120°	1°	$4.50
No. 305B	12″	Fahrenheit,	0° to 220°	2°	4.50
No. 305C	12″	Fahrenheit,	+ 30° to 300°	2°	4.50
No. 305D	14″	Fahrenheit,	+ 30° to 400°	2°	5.25
No. 305E	16″	Fahrenheit,	+ 30° to 600°	2°	6.00
No. 305F	16″	Fahrenheit,	+ 30° to 750°	2°	7.50
No. 305G	16″	Fahrenheit,	+100° to 900°	5°	9.00
No. 305H	16″	Fahrenheit,	+100° to 1000°	5°	10.50
No. 306A	12″	Centigrade,	0° to 100°	1°	4.50
No. 306B	12″	Centigrade,	0° to 150°	1°	4.50
No. 306C	14″	Centigrade,	0° to 200°	1°	5.25
No. 306D	16″	Centigrade,	0° to 300°	1°	6.00
No. 306E	16″	Centigrade,	0° to 400°	1°	7.50
No. 306F	16″	Centigrade,	+ 50° to 480°	2°	9.00
No. 306G	16″	Centigrade,	+ 50° to 540°	2°	10.50

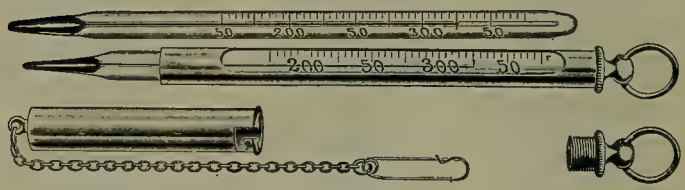
Extra Thermometers for Above

No. 0305A	0305B 0306A	0305C 0306B	0305D 0306C	0305E 0306D	0305F 0306E	0305G 0306F	0305H 0306G
Each $2.25	$2.25	$2.25	$3.00	$3.75	$5.25	$6.75	$8.25

For prevailing prices see latest supplementary price list.

ARMORED ASPHALT-TESTING THERMOMETERS

Standard Grade



No. 312

Asphalt-Testing Thermometers, all glass, engraved stem, nickel-plated brass armor, made exceptionally robust to meet the requirements of use.

No. 310 Length 16 inches, temperature range 100 to 600 degrees, for use in testing asphalt $6.00

No. 311 Length 16 inches, temperature range 200 to 750 degrees, for use in testing sand 7.50

No. 312 Length 6 inches, temperature range 200 to 400 degrees, for use of inspector 4.50

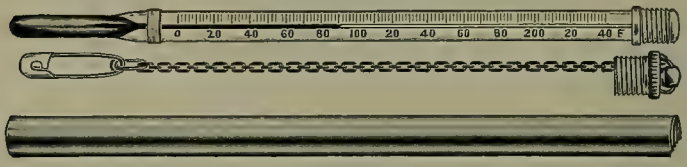
Extra Thermometers for Above

No. 0310 Extra thermometer for No. 310 ..... $3.75

No. 0311 Extra thermometer for No. 311 ..... 5.25

No. 0312 Extra thermometer for No. 312 ..... 2.25

POCKET THERMOMETERS



No. 315

No. 315 Pocket Thermometer, 7-inch, engraved stem, nickel-plated brass screw case and chain, magnifying mercury tube. Approximate scale range 30 degrees below zero to 120 degrees above F. $2.00

No. 316, same as No. 315 but scale range 20 to 220 degrees F..... 2.00

Extra Thermometers for Above

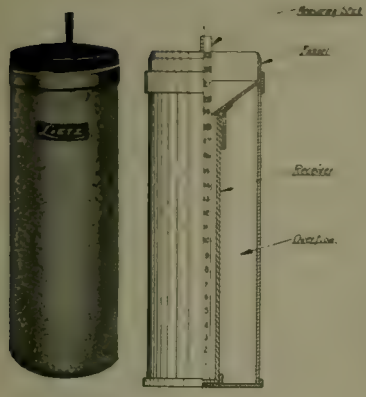
No. 0315 Extra thermometer for No. 315 ..... $1.60

No. 0316 Extra thermometer for No. 316 ..... 1.60

For other pocket thermometers see page 145.

For prevailing prices see latest supplementary price list.

RAIN GAUGES



No. 320

No. 325-326

No. 320 U. S. Weather Bureau Standard Rain Gauge, as made by us, consists of a funnel, a receiver, overflow and a measuring stick. Gauge 25 inches high, funnel 8 inches in diameter. Each $7.50

No. 321, same as No. 320 but 13 inches high, funnel 3 inches in diameter 3.50

The rain collected by the funnel flows into the receiver, which is of smaller diameter than the funnel and so adjusted that the readings are magnified 10 times. To take reading insert measuring stick through the funnel into the receiver and note how high it is moistened. The sticks are graduated in 10ths and 100ths of an inch, one inch of rain actually being 10 inches on the stick. To measure snow, remove the funnel and receiver and after collecting let it melt. Then pour into receiver and measure same as rain. Also measure full depth of snow.

Extra Measuring Sticks for the Above

No. 320A Extra Measuring Stick for No. 320 Rain Gauge..... $0.40

No. 321A Extra Measuring Stick for No. 321 Rain Gauge..... .35

SELF-REGISTERING RAIN GAUGE

No. 325 Self-Registering Rain Gauge, enameled metal case, porcelain dial reading to 10 inches in 1/100ths inches, heavy brass-edged receiver 8x8 inches $30.00

No. 326, same as No. 325 but polished copper case..... 37.00

The Self-Registering Rain Gauge has a receiver 8x8 inches. The rain enters this receiver and is collected in a bucket. When this bucket has received 1/100th of an inch of rain it tilts over, and the hand registers the fall as 1/100th of an inch. The tilting of one bucket brings another in position, which when filled overbalances, registers and brings the first bucket in position again. One complete revolution of the large hand indicates one inch of rain in 1/100ths, and the smaller dial registers up to 10 inches.

Mountains of Cloudland and Rainfall Paper, 5x8 ..... .10

For prevailing prices see latest supplementary price list.

ANEMOMETERS

Anemometers are used to measure the velocity of air currents and are of various designs. Used in tunnels, mines, sewers, also in hospitals, etc., and some patterns to measure the velocity of the wind are fixed on the roofs of buildings, schools, colleges or the private home. Each instrument tested and chart of corrections supplied.

Two-dial instruments will stand pressure of 1000 feet per minute.
Four-dial instruments will stand pressure of 3000 feet per minute.
Not guaranteed in temperatures exceeding 300 degrees F.
Anemometers supplied with patented zero-setting device.

No. 330

No. 332

No. 330 Robinson's Improved Anemometer, works arranged so as to permit the column carrying the arms and cups to rise from center of base, ball bearings to central shaft. Registration by two hands which may be set to zero at commencement of observation, with 3-inch cups, reading to 500 miles..... $45.00

No. 330A, same as No. 330 with addition of ball-bearing weather-vane and fixed points N., E., S. and W..... 70.00

No. 332 Jeweled Airmeter, 4 dials reading to 100,000 feet, with zero-setting attachment, vane opening 2½ inches..... 30.00

No. 332A, same as No. 332, 6 dials reading to 10,000,000 feet, with zero-setting attachment, vane opening 2½ inches..... 30.00

For prevailing prices see latest supplementary price list.

JEWELED ANEMOMETERS

Biram's Pattern

No. 334A

No. 338

No. 334 Biram Anemometer, 3-inch diameter, two dials reading to 1,000 feet with disconnector and zero setting attachment, in leather case $25.00

No. 334A, same as No. 334, but 4-inch diameter and four dials reading to 100,000 feet, in leather case..... 28.00

No. 334B, same as No. 334, but 6-inch diameter and four dials reading to 100,000 feet, in leather case..... 35.00

Extra Leather Cases for Above

No. 335 Extra Leather Case for No. 334..... $2.25
No. 335A Extra Leather Case for No. 334A..... 2.50
No. 335B Extra Leather Case for No. 334B..... 3.25
No. 335AA Extra Leather Sling Case for No. 334A..... 4.75
No. 335BB Extra Leather Sling Case for No. 334B..... 5.75

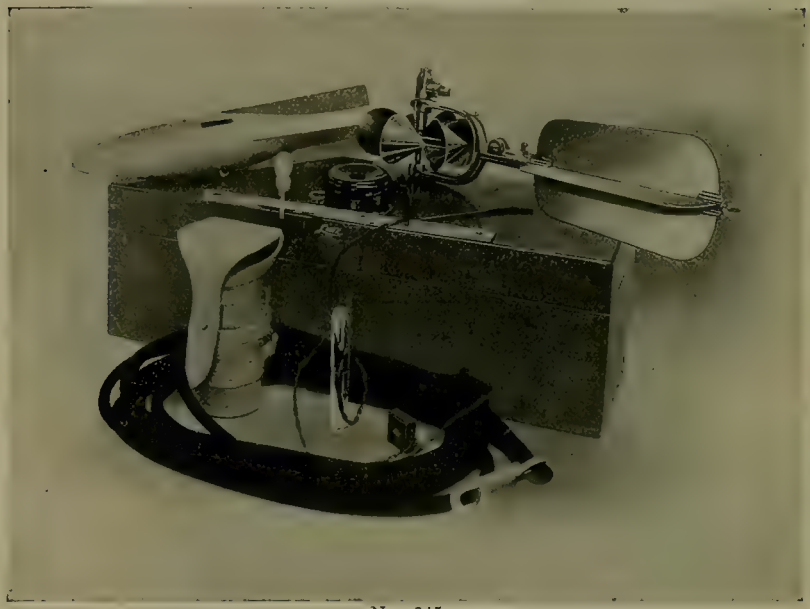
WATCH PATTERN ANEMOMETER

No. 338 Watch Pattern Anemometer, 2-inch diameter, two dials registering to 1,000 feet, with disconnector, hunting case, jeweled movement $40.00

For prevailing prices see latest supplementary price list.

ELECTRIC CURRENT METERS

For the measurement of water velocity in rivers and streams.



No. 345

No. 345 *Electric Current Meter indicating each revolution of the Bucket Wheel, including Telephone Sounder with dry battery, twenty feet of cable and ten-pound torpedo shaped lead weight. All conveniently packed in mahogany carrying case with lock and hooks, including all the essential accessories, each..... $63.50

Individual Calibrated Rating Table for both cable and rod suspension 12.00

Extras for Current Meters

No. 346A Extra Cable, per foot	$0.05
No. 346B Extra Lead Weight, 10 pounds	4.00
No. 346C Extra Lead Weight, 15 pounds	5.00
No. 346D Extra Graduated Tube, 4 sections in canvas case	10.00
No. 346E Socket Cable Connection	.50
No. 346F Current Meter Screws	.35
No. 346G Binding Post Screws	.25
No. 346H Pivot Points	1.25
No. 346I Contact Plugs for Cable	1.00
No. 346J Receiver and Holder	3.00
No. 346K Battery	.65
No. 346L Leather Case for Battery	1.25
No. 346M Screw Driver	.25
No. 346N Oil Can	.25

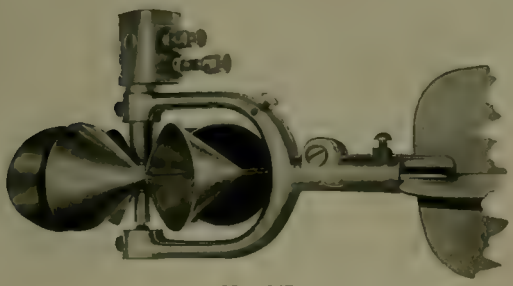
We have furnished several of our meters without the weight and tailvane for shallow stream measurements. Prices on application.

*We desire to call attention to the ball-bearing axis in use in place of pivot bearing as used in other meters of this type. A longer maintenance of rating is made possible by the additional strength and stability of this bearing, being less liable to derangement from knocks they sometimes receive while in use.

For prevailing prices see latest supplementary price list.

ELECTRIC CURRENT METERS

With Penta Head.



No. 347

The above cut is an illustration of our Penta Head Electric Price Current Meter with two binding posts. One indicating each revolution and the other indicating each fifth revolution of the bucket wheels. Either reading may be obtained as the conditions necessitate by merely changing connections from one binding post to the other.

No. 347 Electric Current Meter, same as No. 345 but with the Penta Head, including all the essential accessories	$78.50
Individual Calibrated Rating Table for both cable and rod suspension	12.00
Individual Calibrated Rating Table for both cable and rod suspension by U. S. Bureau of Standards	17.50
Hoyt and Grover, conditions affecting river discharge, methods of measuring and computing, tables, etc., 8 vo., cloth	2.00

STOP WATCHES

No. 350

No. 350 Stop Watch, Swiss, *split-second, nickel plated case, lever movement, 30-minute register by one-fifth seconds	$24.00
No. 351 Stop Watch, Swiss, single sweep, nickel case, cylinder movement, 30-minute register by one-fifth seconds	6.40
No. 352, same as No. 351, but lever movement	8.50
No. 353 Stop Watch with 7-jewel Chronograph, single sweep movement, plain polished or nickel case, 60-minute register by one-fifth seconds	8.25
No. 354, same as No. 353, but 15-jewel Chronograph, single sweep movement	10.00

*The split-second Stop Watch enables one to take two separate records at one time.

For prevailing prices see latest supplementary price list.

LIETZ WATER REGISTERS

As made by us for the U. S. Department of Agriculture

Lietz Water
Register No. 360

(Galvanized Iron Cover
not shown)

The Lietz Water Register, for automatically recording the rise and fall of water in reservoirs, lakes, canals, weirs, etc., was originally designed and manufactured by us for the U. S. Department of Agriculture over twenty years ago, and has found wide application. Its simplicity of construction, together with efficiency and moderate price, has created its popularity. We have made improvements from time to time, which have increased its efficiency, and the Register as made by us today constitutes the best moderate price device on the market.

The customary ratios which we supply and aim to keep in stock are 1:1, 1:2, 1:5, and 1:10, also a device whereby the pencil movement can be changed and made to travel over the drum in a period of either 1 or 8 days. (See Lietz Duplex Time Water Register Nos. 362-363.) Any other ratio, as well as interchangeable ratios, can also be supplied.

The cut shows the latest improvements, which consist principally of a remodeled pencil carriage and a water-tight aluminum clock case; the entire apparatus is enclosed with a galvanized iron cover not shown in the cut.

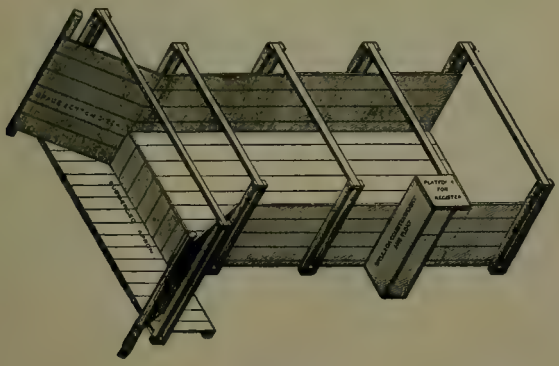
Write for folder containing Instructions for Installation, also abstract from paper published in Bulletin of American Society of Civil Engineers, November, 1910, by J. C. Stevens, describing results obtained.

LIETZ WATER REGISTERS

The Lietz Water Registers are so constructed that the pencil is released by the clock and drawn across the drum by a small weight, which works in unison with the clockworks. The drum is controlled by the float which rests on the surface of the water. This type of construction is a great advantage over the old style, wherein the drum is revolved by the clockwork, inasmuch as it relieves the clockwork of the extra labor of turning the drum, thus assuring greater accuracy of time and also, in case of an extraordinary rise or fall of the water (greater than the capacity of the record sheet), the Lietz Water Register will simply make two or more revolutions and the record can easily be read, while on the old type of construction any rise or fall over the capacity of the Register would be lost.

No. 360 Lietz Improved Water Register with 12-inch drum, high-grade 8-day clock movement, complete with float, weights and strong, galvanized iron hood, 6 months' supply of Record Sheets, and directions for installation, gear 1:1	$55.00
No. 360A, same as No. 360, but geared for both 1:1 and 1:2.....	65.00
No. 360B, same as No. 360, but geared for both 1:1 and 1:5.....	65.00
No. 360C, same as No. 360, but geared for both 1:1 and 1:10.....	65.00
No. 361 Lietz Improved Water Register, similar to No. 360, but with 18-inch drum, with all accessories and directions for installation. Geared 1:1	75.00
No. 361A, same as No. 361, but geared for both 1:1 and 1:2.....	85.00
No. 361B, same as No. 361, but geared for both 1:1 and 1:5.....	85.00
No. 361C, same as No. 361, but geared for both 1:1 and 1:10.....	85.00

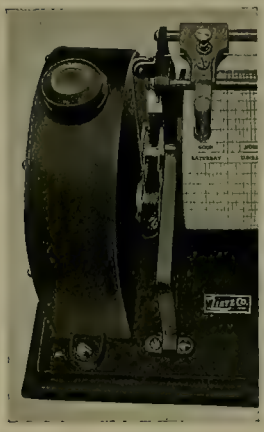
The Lietz Water Registers can be made to order geared to any other desired ratio. Prices on application.



Measuring Flume showing place for Water Register.

For prevailing prices see latest supplementary price list.

LIETZ DUPLEX TIME WATER REGISTERS



No. 362-363

Illustration showing two reels for chain as incorporated in our Duplex Time Water Registers.

The Lietz Duplex Time Water Registers are a modification of our Nos. 360-361 Water Registers. By means of attaching an extra gear and reel to the clockworks, the pencil can be made to travel across the drum in a period of either one or eight days. Either result may be obtained, as conditions necessitate, by winding the chain, which releases the pencil, on the proper reel.

No. 362 Lietz Duplex Time Water Register, with 12-inch drum, high-grade 8-day clock movement, complete with float, weights and strong galvanized iron hood, 6 months' supply of Record Sheets, and directions for installation. Geared 1:1..... $62.50

No. 362A, same as No. 362, but geared for both 1:1 and 1:2..... 72.50

No. 362B, same as No. 362, but geared for both 1:1 and 1:5..... 72.50

No. 362C, same as No. 362, but geared for both 1:1 and 1:10..... 72.50

No. 363 Lietz Duplex Time Water Register, similar to No. 362, but with 18-inch drum, with all accessories and directions for installation. Geared 1:1 ..... 92.50

No. 363A, same as No. 363, but geared for both 1:1 and 1:2..... 92.50

No. 363B, same as No. 363, but geared for both 1:1 and 1:5..... 92.50

No. 363C, same as No. 363, but geared for both 1:1 and 1:10..... 92.50

Lietz Duplex Time Water Registers can also be geared to any other desired ratio on special orders. Prices on application.

Extras for Lietz Water Registers

No. 365A Extra Register Sheets for 12-inch drum, for weekly record, (When ordering state how Register is geared.) Per 100.... $4.00

No. 365B Extra Register Sheets for 18-inch drum, for weekly record. (When ordering state how Register is geared.) Per 100.... 4.00

No. 365C Extra Register Sheets for 12-inch drum, for daily record.* (When ordering state how Register is geared.) Per 100.... 4.00

No. 365D Extra Register Sheets for 18-inch drum, for daily record.* (When ordering state how Register is geared.) Per 100.... 4.00

No. 365E Extra Float for Water Register..... 3.00

No. 365F Extra Cap for Clock Case..... 1.00

No. 365G Extra Weights ..... .60

No. 365H Extra Screws to clamp galvanized cover to base..... .35

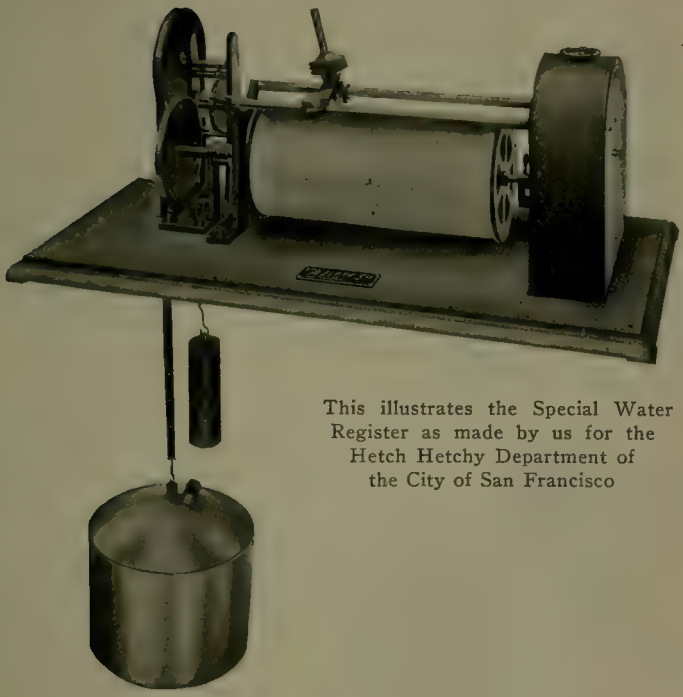
No. 365J No. 34 B. & S. Gauge Brass Wire for Float and Weight. Per spool ..... .60

For prevailing prices see latest supplementary price list.

*Daily Record Sheets can only be used with our Duplex Time Registers.

WATER REGISTERS

Special Registers Made to Order



This illustrates the Special Water Register as made by us for the Hetch Hetchy Department of the City of San Francisco

We have every facility and wide experience for the manufacture of Water Registers to meet any unusual conditions. Correspondence or interviews solicited.

Registers of all makes rated and repaired.

RECORDING TIDE GAUGE

No. 367 The Lietz Self-Recording Tide Gauge. The records are obtained on a continuous roll of blank white paper, 13 inches wide and 22 yards long, through the graphic illustration of the pencil "D," which is actuated by the tides by means of the float "A," while the clock "H" revolves the cylinder "E," causing the supply roll of paper to travel over it and onto the record roller "G," which in turn is wound tightly through the fall of its counterweight. The paper is guided over the cylinder by means of small projecting pins or burs attached to its ends peripherally, which cause a perforation of the paper at intervals of one inch, equal to two hours of record. The scale on which the curve is drawn is such that one inch on the paper equals one foot in tidal height.

The Reference Pencil "I," which may be shifted along its carriage, is a convenience in the establishment of either a mean or initial reading, which readily aids in the taking of observations.

The gauge, once installed and in working order, need not be visited more than once in seven days for the purpose of winding the driving clock and the counterweight attached to the record roller.

Price, complete with all accessories, including a galvanized iron hood (not shown in the illustration) and 6 rolls of record paper..... $150.00

No. 368 Extra Record Paper for Tide Gauge. Per roll of 22 yards... .50

HOOK GAGES

The Hook Gage is a simple instrument used by hydrographers, weir and canal tenders, irrigationists, etc., for observing the water levels in weirs, ditches, canals, or bodies of water of any nature. It has also been found useful for laboratory work.

THE LIETZ POCKET HOOK GAGE

Designed in accordance with suggestions of Mr. D. C. Henny of the U. S. Geological Survey.

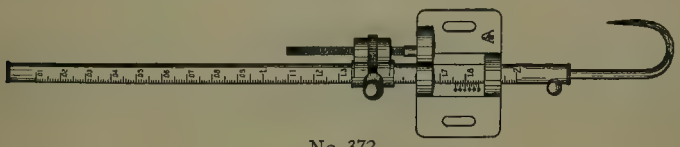
No. 370

No. 370 The Lietz Pocket Hook Gage, graduated bar .25 foot long, divided to 100ths of foot with vernier reading to 1000ths. Supplied with three extension pieces each .25 foot long for total measurement of one foot of depth. In morocco-covered, velvet-lined pocket case, with instructions and table of equivalents by the Francis formula..... $15.00

IMPROVED HOOK GAGE

Entirely of Metal. Nickel Plated

Made after suggestions of Messrs. Metcalf & Eddy, Consulting Engineers of Boston, Mass.



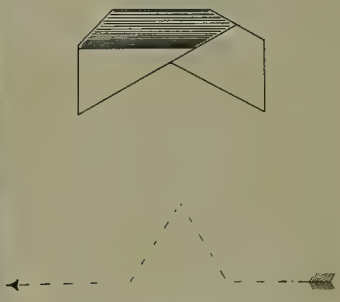
No. 372

No. 372 Improved Hook Gage, made entirely of metal, nickel plated. Tube two feet long, graduated to feet, 10ths and 100ths with vernier reading to 1000ths. The hook may be extended 12 inches from within the tube, permitting it to be set to the exact level of the water. Metal plate with holes for attaching gage to side of flume $25.00

Improved Metal Hook Gages like No. 372 but with longer tubes can be made on special order. Prices on application.

HENSOLDT IMPROVED PRISM BINOCULARS

No. 375



Construction.

Aluminum Frames, covered in black morocco* leather. Jointed cross bars for adjustment of pupillary distances. Universal focusing arrangement, and one turning eye-piece, graduated plus and minus, for unequal strength of eyes. Binoculars contained in genuine leather case with sling strap.

The novel combined prism of the Hensoldt Binocular as shown in the above illustration allows the employment of object glasses of larger aperture (up to 2 inches), thereby giving a higher degree of brightness than other glasses. It also permits the reduction of the Aluminum Frame to the slender shape of a telescope, as well as securing the optical elements more rigidly in proper relation to each other.

This illustration shows the easy access to internal optical parts for cleaning.

*On special order Hensoldt Prism Binoculars can be furnished in tan leather.

HENSOLDT IMPROVED PRISM BINOCULARS

Field of view
As seen with a Galilean Glass
6 × Magnification

As seen with Hensoldt 6 × Magnification

Hensoldt Prismatic Binoculars possess perfect definition, flatness of field and equal illumination up to the edge of the image.

Prices and Specifications (Genuine Leather Sling Case)

	Magnification Diameter	Object Glass	Field at 1000 Yards	Relative Brightness	Width and Height	Price
375—1 Prism Binocular	3½	⅝ in.	220 yds.	18	3½x3¾ in.	$40.00
" 2 " "	6	1 1/32 "	125 "	18	5 x4¼ "	46.00
" 3/4 " "	8	1 1/32 "	100 "	12	5 x4¼ "	52.00
" 5 " "	12	1 1/32 "	64 "	5	5 x4¼ "	62.00
" 6 " "	6	1⅜ "	148 "	34	6 x5 "	60.00
" 7 " "	10	2 "	90 "	25	7½x5⅝ "	90.00
" 8 " "	12	2 "	70 "	17	7⅞x5⅝ "	95.00

HENSOLDT IMPROVED PRISM MONOCULARS

Hensoldt Improved Prism Monoculars are of the same construction as No. 375 Prism Binoculars, differing in that they have but one barrel. The focusing of the monocular is accomplished by turning the eye-piece.

Prices and Specifications (Genuine Leather Sling Case)

	Magnification Diameter	Object Glass	Field at 1000 Yards	Relative Brightness	Width and Height	Price
376—1 Prism Monocular	3½	⅝ in.	220 yds.	18	3⅝x1 5/16 in.	$14.00
" 2 " "	6	1 1/32 "	125 "	18	5¼x1¾ "	18.50
" 3/4 " "	8	1 1/32 "	100 "	12	5¼x1¾ "	20.50
" 5 " "	12	1 1/32 "	64 "	5	5¼x1¾ "	25.00
" 6 " "	6	1⅜ "	148 "	34	6¼x2 "	22.00
" 7 " "	10	2 "	90 "	25	7⅞x2½ "	35.00
" 8 " "	12	2 "	70 "	17	7⅞x2½ "	40.00

RAY FILTER

Hensoldt Prismatic Binoculars and Monoculars are often furnished with an extra amber glass to the eye-piece, known as a Ray Filter, to take observations against the sun. This is adjusted by a little catch on the side of each barrel and the glass can be used with or without the Ray Filter.

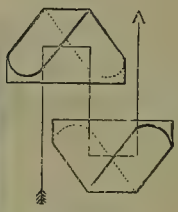
No. 377, extra charge for Ray Filter..... $2.50

For prevailing prices see latest supplementary price list.

PRISM BINOCULARS

Stereo-Walkar Type

No. 380



Construction

No. 380—Tourists' Type

Mounted in aluminum frame, black morocco covered*. Jointed cross bars for adjustment of pupillary distances. Universal focusing arrangement and one turning eye-piece, graduated plus and minus, for unequal strength of eyes. In genuine leather case with sling strap.

No. 381—Army Type

These glasses instead of having the Universal focusing arrangement are fitted with two turning, graduated, eye-pieces by means of which the glass is focused. (Prices the same as No. 380 Tourists' Type.)

Prices and Specifications (with Genuine Leather Sling Case)

Type No.	Magnification Diameter	Object Glass mm	Field at 1000 m	Relative Brightness	Price
12	6	24	130	16	$45.00
10¾	8	24	115	9	50.00
15	12	30	65	6.25	57.50

No. 385

Special Binoculars with a greater relative brightness and an exceptional large field—

Type No.	Magnification Diameter	Object Glass mm	Field at 1000 m	Relative Brightness	Price
16	6	30	150	25	$57.00
20¾	8	30	115	14	60.00

NOTE.—These glasses can be supplied with Ray Filters, see page 175.

TRIPOD AND CLAMP FOR FIELD GLASSES

No. 385 Adjustable Clamp and Metal Extension Tripod, suitable for any Field Glass or Prismatic Binocular..... $7.50

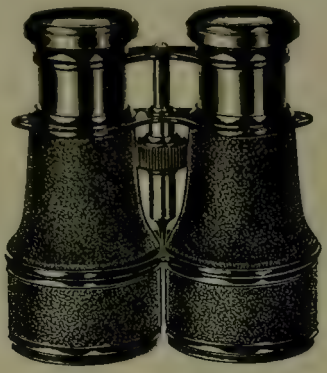
*On special order these Binoculars can be furnished in tan leather.

For prevailing prices see latest supplementary price list.

FIELD GLASSES

The Field Glasses listed below are especially made for us by one of the best binocular manufacturers and are first class in every respect.

No. 390



No. 392-394

Lietz Superior Quality Field Glasses, black leather covered, fine japanned finish, in leather case with strap.

No. 390 Lietz Field Glass, 6 lenses, 2-inch objectives, low form, in leather case with strap; magnification, 2¾ times; field at 1000 yards, 200 yards $15.00

No. 392 Lietz Field Glass, 6 lenses, 2-inch objectives, high form with sunshades, in leather case with strap; magnification, 3½ times; field at 1000 yards, 120 yards..... 16.00

No. 393, same as No. 392 but 2¼-inch objectives, in leather case with strap; magnification, 5 times; field at 1000 yards, 80 yards.. 18.00

No. 394, same as No. 392 but 2½-inch objectives, in leather case with strap; magnification, 3¾ times; field at 1000 yards, 110 yards 20.00

No. 395 Lietz Field Glass, 6 lenses, same type as No. 392, with sunshades, but smaller, 1⅓-inch objectives, in leather case with strap; magnification, 3¾ times; field at 1000 yards, 100 yards 15.00

In addition to the above glasses we carry a complete line of Marine Glasses and Telescopes, etc. If interested send for our Nautical Catalog.

TELESCOPIC RIFLE SIGHTS

If interested in Rifle Sights write for special circular.

For prevailing prices see latest supplementary price list.

~~ALCO~~ QUALITY
ENGINEERS' FIELD AND MINE EQUIPMENT

We herewith present to the engineering profession a line of supplies which we feel confident will meet with their approval as regards merit and practicability.

Our own factory facilities, combined with our buying connections, enable us to present all the better brands of merchandise offered by houses specializing in their respective lines, and it will always be our endeavor to handle only the best articles produced for any particular purpose.

We hope our friends will keep the significance of these remarks ever in mind when ordering, feeling assured that when ordering from us they are getting the best the market affords.

Order by Lietz Catalog numbers, and get Lietz quality goods.

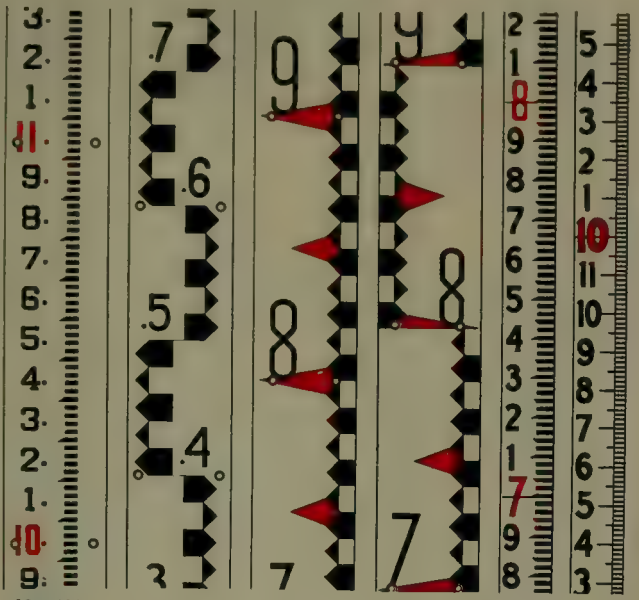
LEVELING RODS

The Leveling Rods, Nos. 410-425, listed on page 181, are of our own manufacture, graduated to hundredths, by uniform, clean divisions. The black numerals, corresponding to the tenths, have an exact height of 0.06 foot and the red or foot numerals are 0.08 foot high. This affords a rod reading at distances where graduation lines disappear. The wood is the best, thoroughly seasoned. The target and all connecting metal parts are cast in one piece; the vernier made to read to thousandths; the scale is brass, face of target japanned. We recommend these rods to be the best in the market. Made in two self-reading designs, known as the block and line graduations, similar to the Philadelphia pattern.

We also manufacture a complete line of Flexible Leveling Rods and Stadia Rods as listed on the following pages.

FLEXIBLE LEVEL RODS

No. 400

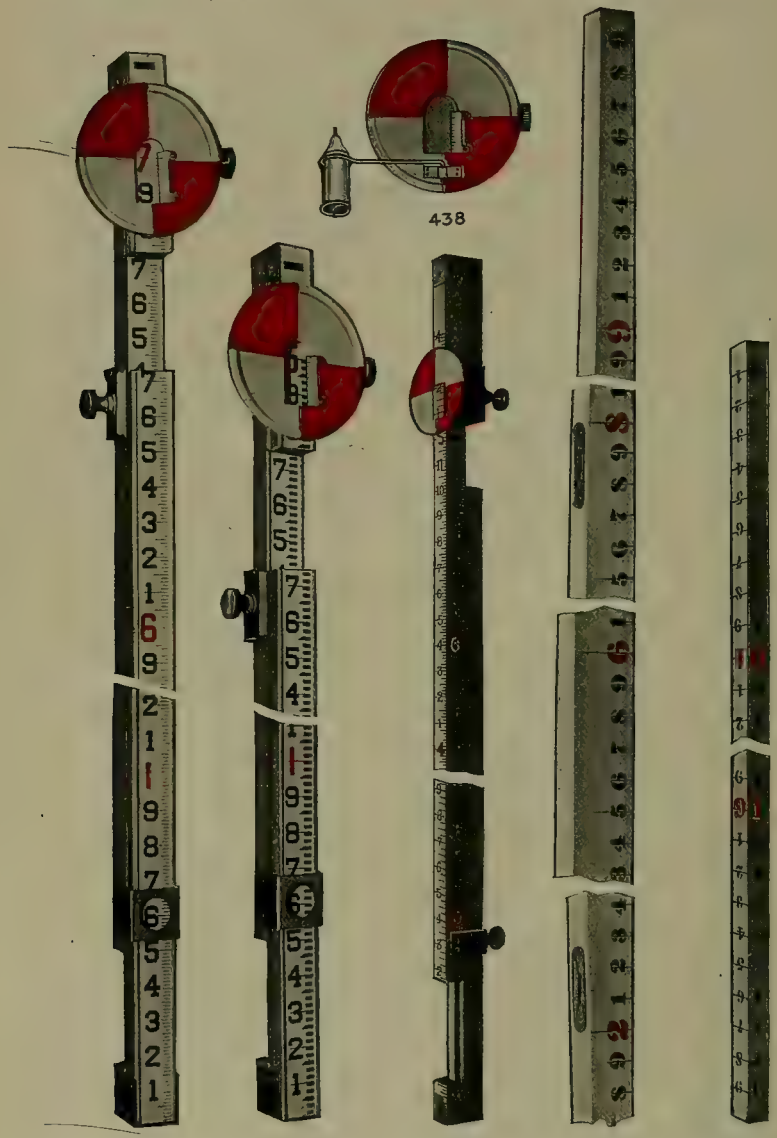


No. 401 No. 402 No. 404 No. 405 No. 406 No. 408

The Lietz Flexible Rods are 12 feet long and 3 inches wide.

No. 400	Lietz Flexible Level Rod, diamond design, alternating, painted on especially prepared oil canvas. May be rolled up in a package 3 inches long and less than 1½ inches in diameter. Weight 3 ounces. Punched with eyelets for attachment to board	$4.00
No. 401	Lietz Flexible Level Rod, same as No. 400 but Philadelphia design	4.00
No. 402	Lietz Flexible Level Rod, same as No. 400 but in the metric system	4.00
No. 404	Lietz Flexible Level Rod, same as No. 400 but Grunsky design "A"	4.00
No. 405	Lietz Flexible Level Rod, same as No. 400 but Grunsky design "B" (alternating)	4.00
No. 406	Chicago Flexible Level Rod, 1½ inches wide, 12½ feet long, graduated to 100ths of feet	1.25
No. 406A,	same as No. 406 but 16½ feet long	1.60
No. 406B,	same as No. 406 but 20½ feet long	2.00
No. 407,	same as No. 406 but made of Flexible Brass, very durable	5.00
No. 408	Chicago Flexible Level Rod, 1½ inches wide, 12½ feet long, graduated in feet, inches and eighths	1.25

For prevailing prices see latest supplementary price list.



438

410-415 421-425 430-431 446 447

LEVELING RODS

As described on page 178.

No. 410-415—LINE GRADUATION

No.	410	411	412	413	414	415
Length in feet	8 to 15	7 to 13	6½ to 12	5 to 9	4 to 7	3 to 5
Price	$17.00	$16.00	$13.00	$12.75	$12.75	$12.00

No. 421-425—BLOCK GRADUATION

No.	421	422	423	425
Length in feet	7 to 13	6½ to 12	5 to 9	3 to 5
Price	$15.00	$13.00	$12.75	$12.00

ARCHITECTS' RODS

No. 430 **Architects' Leveling Rod,** 5½ to 10 feet, brass mounted, with clamp and target, divided in feet, inches and 8ths, vernier reading to 64ths of inch $6.00

No. 431, same as No. 430 but divided in feet, 10ths and 100ths, vernier reading to 1000ths of foot 6.00

Extra Targets and Canvas Bags for Leveling Rods

No. 437 Extra Target for Philadelphia Leveling Rod $5.00

No. 438 Target with swinging candle bracket for illuminating vernier, for use in mines, tunnels, etc 6.50
If ordered with a new rod in lieu of the ordinary, extra 1.50

No. 439 Extra Target for Architects' Rods, No. 430-431 ..... 1.50

No. 440 Extra Target or Clamp Screw for Leveling Rods ..... .25

No. 441 Sewed Canvas Bag for Philadelphia Leveling Rods to 12 feet 1.50

No. 442 Sewed Canvas Bag for Philadelphia Leveling Rods to 15 feet 2.00

LIETZ CROSS SECTION RODS

No. 446 **Lietz Cross Section Rod,** one-piece, 10 feet long; graduated in feet and 10ths, with level vial at each end $10.00

No. 447 **Lietz Vertical Cross Section Rod,** hardwood, 7 feet long, 1 inch square with iron shoes. Graduated on four sides in feet and 10ths reading both ways, for use in conjunction with horizontal Cross Section Rod No. 446 ..... 10.00

No. 449

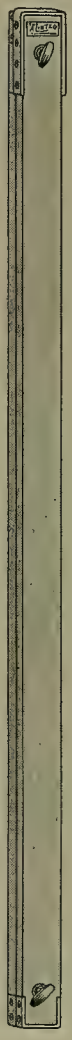
ROD LEVEL

No. 449 Lietz Improved Rod Level $3.00

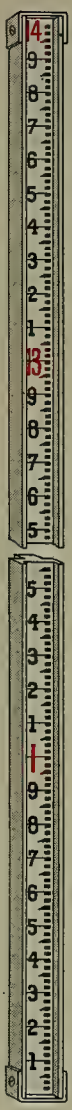
This Rod Level is an improved type, used to hold rod or pole of any shape perpendicular. The level bubbles are sunk in the casting at right angles to each other, thereby lessening the possibility of breakage, as well as making it easier for the rodman to hold the bubbles in the center than the old form of circular spirit levels. The latter are continually leaking and it is impossible to keep them in order.

The Improved Rod Level can either be fastened to the rod by means of a flat-head screw, for which there is a key slot provided, or pressed against the rod or pole while holding. Indispensable for stadia work.

450-455
DIAMOND DESIGN



450-455
FOLDED



460-462

465

466

468

469

LIETZ STADIA RODS

For designs of Flexible Level Rods, see page 179.

No. 450 Lietz Stadia Rod, 2¾ in. wide, diamond design (alternating), 12 feet long, 2-fold. Same design as Flexible Rod No. 400.. $12.50

No. 451 Lietz Stadia Rod, 2¾ in. wide, diamond design (alternating), 15 feet long, 3-fold. Same design as Flexible Rod No. 400.. 15.00

No. 452A Lietz Stadia Rod, 2¾ in. wide, **Grunsky design** "A," 12 feet long, 2-fold. Same design as Flexible Rod No. 404..... 16.00

No. 452B Lietz Stadia Rod, 2¾ in. wide, **Grunsky design** "B" (alternating), 12 feet long, 2-fold. Same design as Flexible Rod No. 405 ..... 16.00

No. 453A Lietz Stadia Rod, 2¾ in. wide, **Grunsky design** "A," 15 feet long, 3-fold. Same design as Flexible Rod No. 404..... 19.00

No. 453B Lietz Stadia Rod, 2¾ in. wide, **Grunsky design** "B," 15 feet long, 3-fold. Same design as Flexible Rod No. 405..... 19.00

No. 454 Lietz Stadia Rod, 2¾ in. wide, graduated in the metric system, 3 meters long, 2-fold. Same design as Flexible Rod No. 402 ..... 12.50

No. 455 Lietz Stadia Rod, 2¾ in. wide, graduated in the metric system, 4½ meters long, 3-fold. Same design as Flexible Rod No. 402 ..... 15.00

No. 460 Lietz Plain Stadia Rod, Philadelphia block design, in one piece with tapering rib, 10 feet long 6.00

No. 461, same as No. 460 but 12 feet long 7.00

No. 462, same as No. 460 but 14 feet long..... 8.00

Grunsky G. E. Topographic Stadia surveying with reduction tables and diagrams... 2.00

RANGING POLES

Steel Ranging Poles, ½ inch in diameter, octagonal, solid with pointed end, divided in feet, alternately red and white.

No. 465A— 6 feet $2.75

No. 465B— 8 feet 3.00

No. 465C—10 feet 3.25

Wooden Ranging Poles, ⅞ to 1⅛ inches in diameter, tapered, octagonal with steel pointed shoe, divided in feet, alternately red and white.

No. 466A— 6 feet 2.00

No. 466B— 8 feet 2.25

No. 466C—10 feet 2.50

Wooden Ranging Poles, like No. 466 but divided in meters.

No. 467A—2 meters 2.50

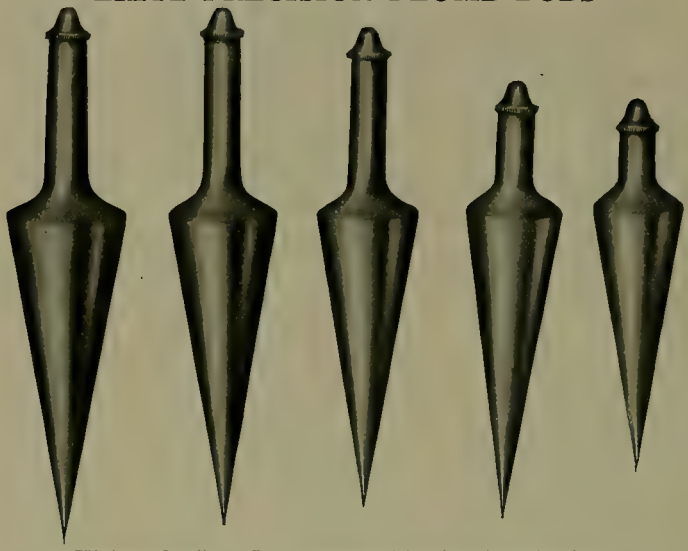
No. 467B—2½ meters 3.00

No. 467C—3 meters 3.75

No. 468 Sectional Ranging Poles, 1 1/16 in. in diameter, round, wooden. In two sections, each 4½ feet long, jointed with metal telescope tubing, making an absolutely rigid pole 8½ feet long with steel pointed shoe. In two-pocket canvas bag 3.00

No. 469 Sectional Mining Pole, as No. 468 but ⅝ in. in diameter and in three sections, each 33 in. long, lengthening out to 7¼ feet. In three-pocket canvas bag..... 3.00

LIETZ PRECISION PLUMB BOBS



Highest Quality. Screw caps and hardened steel points.

Number—	475	476	477	478	479	480	481	482
Weight—	8 oz.	12 oz.	14 oz.	16 oz.	18 oz.	20 oz.	24 oz.	48 oz.
Price	$1.75	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$5.00

PLUMB-BOB CORD AND WIRE

		Per yd.
No. 485A	Best Braided Linen Cord, Thick	$0.02
No. 485B	Best Braided Linen Cord, Medium ...	.02
No. 485C	Best Braided Linen Cord, Thin	.02
No. 486	Best Braided Silk Cord, Oiled, Medium	.06

Plumb-bob Cord is put up in 25- and 100-yard hanks.

No. 485B

No. 487 Brass Wire, 31 B. & S. Gauge, in spools of 500 feet; per spool $1.35

No. 488 Music Wire .046, 232 feet, per coil..... .95

No. 489 Music Wire, .040, 172 feet, per coil..... 1.00

BOB LINE TARGETS

No. 490 Wuth's Bob Line Target, made of pressed metal, for attaching to plumb-bob line. Painted red and white. Each $0.50

No. 491 Bob Line Targets, made of heavy paper, 2¼x2 inches square. Printed red and white. Cut at top and bottom for attaching to plumb-bob line. In packs of 25; per pack..... $0.25

No. 490

For prevailing prices see latest supplementary price list.

CHAINING BOBS AND SCABBARDS

Nos. 495-504

Nos. 511-512

No. 516

Lietz Universal Plumb Bobs for chaining. Made of brass, highly finished, with removable steel points and screw caps.

No.	495	496	497	498	499	500	501	502	503	504
Wght.	2 oz.	6 oz	8 oz.	10 oz.	12 oz.	14 oz.	16 oz.	18 oz.	24 oz.	40 oz.
Price	$0.55	$0.80	$1.20	$1.35	$1.50	$1.65	$1.85	$2.00	$2.75	$4.20

Extras for Plumb Bobs

No. 510A Extra Points, 6 to 12 oz..... $0.20
No. 510B Extra Points, 14 to 40 oz..... .25
No. 510C Extra Caps (when ordering state weight of bob)..... .35

MERCURY PLUMB BOBS

(Body of steel)

No. 511 Mercury Bob, 12 oz., 5⅜ inches long x ⅞ inch diameter..... $2.25
No. 512 Mercury Bob, 16 oz., 6 inches long x 1 inch diameter..... 2.75

IRON BOBS

No. 515 Iron Plumb Bob, 7 oz..... $0.50

LEATHER SCABBARDS FOR PLUMB BOBS

Our Scabbards are made with a leather strip which fits over the top of the bob, insuring it against loss. The back is a heavy piece of flat leather and the point of the bob cannot wear through and injure the user; with belt loop.

No. 516A Scabbard for Plumb Bob, 8 to 12 oz..... $0.50
No. 516B Scabbard for Plumb Bob, 14 to 16 oz..... .60
No. 516C Scabbard for Plumb Bob, 18 to 24 oz..... .65
No. 516D Scabbard for Plumb Bob, 40 to 48 oz..... .75

When ordering please state weight of bob for which scabbard is intended.

No. 520

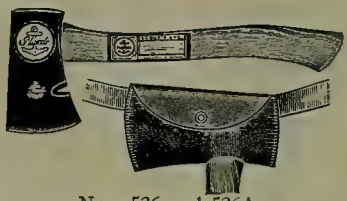
No. 520 Plummet Adjuster. By pressing sides of adjuster and moving it up or down the proper length of string the plummet height is quickly secured with one hand, leaving the other hand free to shift the transit head to position over tack or center. The adjuster grips instantly on releasing pressure. No tying or untying of knotted strings. Saves time, trouble and tiresome stooping. Price, each $0.60

For prevailing prices see latest supplementary price list.

ENGINEERS' BUSH KNIVES, HOOKS AND AXES

No. 521

No. 523



Nos. 526 and 526A

No. 521 Engineers' Bush Knives for cutting shrubs, brush, etc., and for pointing stakes. 24-inch blade $1.50
No. 522, same as No. 521 but 17-inch blade 1.25
No. 523 Engineers' Bush Hooks, fitted with long ax handle 1.50
No. 524 Engineers' Axes, with broad head. For pointing and driving stakes, cutting trees, etc. Long handle. Weight 5 pounds 1.75
No. 525, same as No. 524 but weight 3½ pounds 1.50
No. 526 Select Quality Hand Ax. Weight 2 pounds ..... .75
No. 526A Select Quality Hand Ax in leather sheath 1.10

STAKE TACKS AND SURVEYING SPADS

No. 528

No. 530

No. 531

No. 532

No. 528A Stake Tacks, galvanized, tin box of 50 ..... $0.10
No. 528B Stake Tacks, galvanized, tin box of 100 ..... .15
No. 528C Stake Tacks, galvanized, in one-pound packages ..... .50

Above Tacks have an indentation in the surface of the head, to guide plumb bob point.

Surveying Spads, non-corrosive steel, 1⅜ inches long, for suspending plumb bob from timbers in mines:

No. 530A Tin Box of 50 ..... .65
No. 530B in bulk, per 1,000 ..... 10.00

Surveying Spads, like No. 530 but 2 inches long:

No. 531A Tin Box of 50 ..... .75
No. 531B in bulk, per 1,000 ..... 11.00

Surveying Spads, hook shape, steel, 2 inches long:

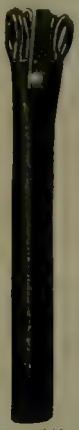
No. 532A Tin Box of 50 ..... .75
No. 532B in bulk, per 1,000 ..... 11.00

For prevailing prices see latest supplementary price list.

SURVEYORS' ARROWS

The rings are enameled in bright vermilion.

Nos. 534-537



No. 549

No. 534	Steel Arrows, extra heavy, nickel plated, 10 inches long. Per set of 11	$1.30
No. 535	Steel Arrows, extra heavy, nickel plated, 14 inches long. Per set of 11	1.50
No. 536	Steel Arrows, not nickel plated, 10 inches long. Per set of 11	1.00
No. 537	Steel Arrows, not nickel plated, 14 inches long. Per set of 11	1.10
No. 538	Steel Arrows, painted red and white alternately every inch, 14 inches long. Per set of 11	1.50
No. 539	Steel Arrows, painted red and white alternately every inch, 6 inches long. Per set of 11	1.00

CARRYING RINGS AND SCABBARDS FOR ARROWS

No. 545	Steel Carrying Ring for Arrows	$0.15
No. 547	Cloth-covered Scabbard with carrying strap	1.00
No. 548	Leather Scabbard with carrying strap	2.00
No. 549	Leather Scabbard with belt strap	1.25

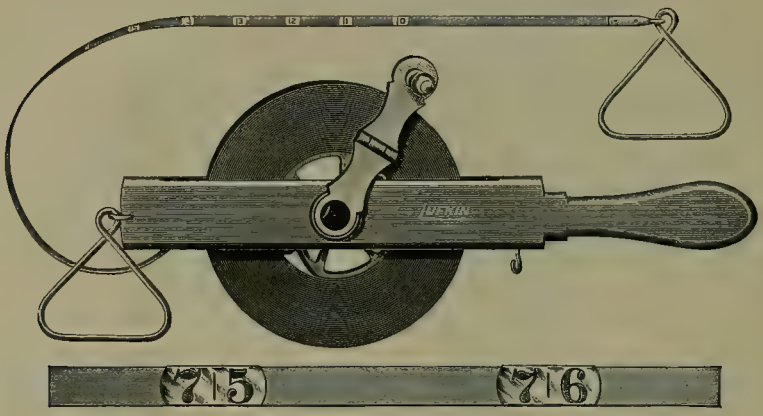
CLOTH FOR SURVEYORS' FLAGS

No. 550	Red or white cloth. Per yard	$0.18

For prevailing prices see latest supplementary price list.

SURVEYORS' CHAIN TAPES

Etched Graduations



With heavy ¼-inch steel tape. Nicely finished hardwood reel, with large metal folding handle, and two large detachable rings. Trimmings nicely nickel plated. The graduations on these tapes are etched, and wherever graduated the steel has a bright, raised surface, with the figures etched in. The steel being tempered and of the finest quality the graduations and figures will never be effaced, but will always show up clear and distinct. As a convenient, strong, durable chain tape for heavy field work ours excels all others, and we guarantee it in every way.

Graduations

All chain tapes shown on this page are graduated one side only in feet, every foot, or links and poles every link, as ordered. Tapes graduated in feet have end feet graduated in 100ths of a foot. Tapes graduated in links have end links graduated in tenths of links. Tapes with metric measure are graduated the first decimeter in millimeters, balance of first meter in centimeters, balance of tape in decimeters.

Tapes Complete, with Reel

		Wt. Each	Each
No. 5100	100 ft.,	2½ lbs.	$6.00
" 5150	150 "	3¾ "	7.50
" 5200	200 "	4½ "	9.00
" 5300	300 "	5½ "	12.50
" 5066	100 links,	2 "	5.00
" 5132	200 "	3½ "	7.00
" 5198	300 "	4½ "	9.00
" 5082M	25 meter,	2¼ "	5.75
" 5100M	30 "	2½ "	6.50
" 5164M	50 "	3¾ "	9.50
" 5328M	100 "	5¾ "	17.00
Reel only			2.00

Tapes Only, with Thongs

		Wt. Each	Each
No. 05100	100 ft.,	2¼ lbs.	$4.00
" 05150	150 "	3 "	5.50
" 05200	200 "	3¾	7.00
" 05300	300 "	5	10.50
" 05066	100 links,	1¾ "	3.00
" 05132	200 "	2¾ "	5.00
" 05198	300 "	3¾ "	7.00
" 05082M	25 meter,	2 "	3.75
" 05100M	30 "	2¼ "	4.50
" 05164M	50 "	3¼ "	7.50
" 05328M	100 "	5¼ "	15.00
Thongs only		per pair	.50

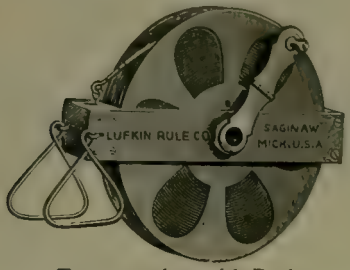
CITY ENGINEERS' CHAIN TAPES

Graduated to 100ths throughout their entire length

No. 5050S—50 feet, in leather case like No. 233. See page 197	$8.00
No. 5100S—100 feet, with reel, as shown above	9.50
No. 05100S—100 feet, without reel	7.50
No. 05100SC—Same as No. 05100S but fully certified	10.00

For prevailing prices see latest supplementary price list.

MINING ENGINEERS' CHAIN TAPES
ETCHED GRADUATIONS



Tape complete with Reel

7·5 LUFKIN 7·6

With heavy ⅛-inch steel tapes, hardwood frame with substantial sheet steel open reel. Large metal folding handle and two detachable rings. One side of frame is provided with a large and convenient leather loop for holding. The graduations on these tapes are etched, and wherever graduated, the steel has a bright, raised surface, with the figures etched in. The steel being tempered and of the finest quality, the graduations and figures will never be effaced, but will always show up clear and distinct.

GRADUATIONS

All chain tapes shown on this page are graduated one side only in feet, every foot, or links and poles every link, as ordered. Tapes graduated in feet have end feet graduated to tenths, and, unless otherwise specified, will be sent end feet in hundredths. Tapes graduated in links have end links graduated in tenths of links. Tapes with metric measure are graduated the first decimeter in millimeters, balance of first meter in centimeters, balance of tape in decimeters.

Tapes Complete, with Reel

		Wt. Each	Each
No. 4100	100 ft.,	3¼ lbs.	$7.50
" 4150	150 "	3¾ "	9.00
" 4200	200 "	4¼ "	10.50
" 4300	300 "	5½ "	14.00
" 4500	500 "	7 "	21.50
" 4650	650 "	8½ "	28.00
" 4660	660 "	8½ "	28.50
" 4066	100 links,	3 "	6.50
" 4132	200 "	3½ "	8.50
" 4198	300 "	4¼ "	10.50
" 4330	500 "	5¾ "	15.50
" 4082M	25 meter,	3 "	7.25
" 4100M	30 "	3¼	8.00
" 4164M	50 "	3¾ "	11.00
" 4328M	100 "	5¾ "	18.50
Reel only			3.50

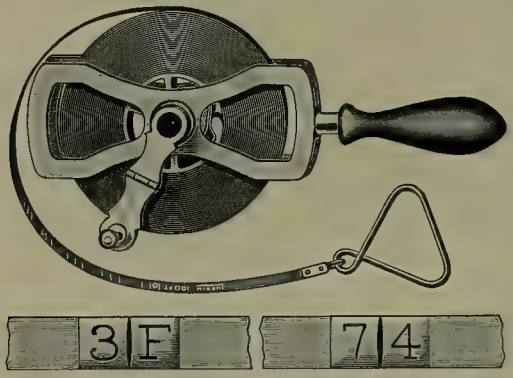
Tapes Only, with Thongs

		Wt. Each	Each
No. 04100	100 ft.,	1¾ lbs.	$4.00
" 04150	150 "	2 "	5.50
" 04200	200 "	2¼ "	7.00
" 04300	300 "	3¼ "	10.50
" 04500	500 "	5 "	18.00
" 04650	650 "	6¼ "	24.50
" 04660	660 "	6¼ "	25.00
" 04066	100 links,	1½ "	3.00
" 04132	200 "	2 "	5.00
" 04198	300 "	2¼ "	7.00
" 04330	500 "	3½ "	12.00
" 04082M	25 meter,	1½ "	3.75
" 04100M	30 "	1¾ "	4.50
" 04164M	50 "	2 "	7.50
" 04328M	100 "	3½ "	15.00
Thongs only		per pair	.50

For prevailing prices see latest supplementary price list.

CONSTRUCTION ENGINEERS' CHAIN TAPES

Graduated on Babbitt Metal



This tape is designed to answer the requirements of the most severe usage, and to take the place of the old-time, yet indestructible, steel chain. It is made of practically unbreakable steel, somewhat heavier than the ordinary chain tape.

Graduations are stamped into Babbitt Metal at each foot, end feet in tenths; or at each link, end links in 10ths of links. Each tape is provided with a pair of detachable handles, or rawhide thongs, as desired.

Special attention is called to this reel, which is built especially for Babbitt Metal tapes. Nickel-plated metal frame, with folding winding handle. A very serviceable reel, easily wound and of beautiful finish.

Tapes Complete, with Reel		Tapes Only, with Thongs	
3/16 inch wide.	Each	3/16 inch wide.	Each
No. 2100—100 feet	$6.00	No. 02100—100 feet	$4.00
No. 2150—150 feet	8.50	No. 02150—150 feet	5.50
No. 2200—200 feet	9.35	No. 02200—200 feet	6.35
No. 2300—300 feet	11.40	No. 02300—300 feet	8.40
No. 2500—500 feet	18.65	No. 02500—500 feet	13.65
No. 2066—100 links	5.25	No. 02066—100 links	3.25
No. 2132—200 links	8.25	No. 02132—200 links	5.25
No. 2198—300 links	9.35	No. 02198—300 links	6.35
No. 2330—500 links	15.25	No. 02330—500 links	10.25
5/16 inch wide.	Each	5/16 inch wide.	Each
No. 3050— 50 feet	$5.00	No. 03050— 50 feet	$3.00
No. 3100—100 feet	6.00	No. 03100—100 feet	4.00
No. 3066—100 links	5.25	No. 03066—100 links	3.25

We can furnish other lengths of 5/16-inch tapes to order.

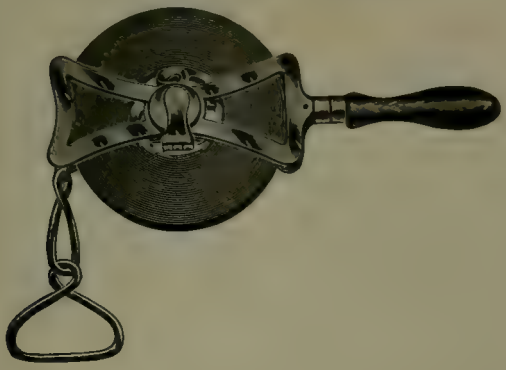
SHOULDERS FOR CHAIN TAPES

Some surveyors use in chaining a tape equipped with shoulders. These shoulders assist in locating the zero and the last graduation. They are carefully soldered to the tape and when so ordered will be supplied on any of our chain tapes.

Order by "W. S." Extra, per pair..... $0.50

For prevailing prices see latest supplementary price list.

CHICAGO STEEL TAPES



Chicago Steel Tapes are made of the best quality flexible steel ribbons carefully tempered to prevent kinking. Made in two widths, 3/16 and 5/16 inch. Plainly divided at every foot, link or meter, end divisions in 10ths The divisions are deeply stamped on solder and are clear and legible and begin 6 inches from the end. These tapes are made under a ten-pound strain at a temperature of 70° Fahrenheit.

With or without nickel-plated metal frame with folding handle. Each tape supplied with two detachable handles or rawhide thongs, as desired.

Tapes Complete, with Reel		**Tapes Only, with Thongs**	
3/16 inch wide	Each	3/16 inch wide	Each
No. 8100—100 feet.....	$5.00	No. 08100—100 feet.....	$3.75
No. 8200—200 feet.....	9.00	No. 08200—200 feet.....	6.00
No. 8300—300 feet.....	12.00	No. 08300—300 feet.....	8.00
No. 8500—500 feet.....	18.00	No. 08500—500 feet.....	13.00
No. 8066—100 links.....	4.25	No. 08066—100 links.....	3.00
No. 8132—200 links.....	7.00	No. 08132—200 links.....	5.00
5/16 inch wide	Each	5/16 inch wide	Each
No. 9050— 50 feet.....	$4.25	No. 09050— 50 feet.....	$3.00
No. 9100—100 feet.....	5.00	No. 09100—100 feet.....	3.75
No. 9200—200 feet.....	9.00	No. 09200—200 feet.....	6.00
No. 9066—100 links.....	4.25	No. 09066—100 links.....	3.00
No. 9132—200 links.....	7.00	No. 09132—200 links.....	5.00
No. 9020M—20 meters.....	4.25	No. 09020M—20 meters....	3.00
No. 9040M—40 meters.....	7.00	No. 09040M—40 meters....	5.00

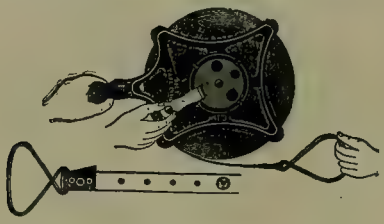
We can furnish other lengths of 5/16-inch tapes to order.

Chicago Steel Tapes can be furnished with shoulders, see page 190.

For prevailing prices see latest supplementary price list.

MAINTENANCE OF WAY CHAIN TAPES

"ROE'S" STEEL TAPES AND REELS



About ¼ inch wide, graduated every foot or link by brass rivets, and each end foot in 10ths. Every 5 feet or link has a brass clasp with numbers, and every 10 feet or link has a copper clasp with numbers stamped on both sides thereof. Furnished with detachable rings or rawhide thongs as desired.

Tapes Complete, with Reel			Tapes Only, with Rings		
	Plain	Nickel plated		Plain	Nickel plated
No. 7A 50 feet	$4.00	$5.00	No. 07A 50 feet	$2.50	$3.50
No. 1A 100 feet	5.00	6.00	No. 01A 100 feet	3.50	4.50
No. 11A 200 feet	7.50	9.00	No. 011A 200 feet	5.50	7.00
No. 30 300 feet	10.00	12.00	No. 030 300 feet	8.00	10.00
No. 4 100 links	5.00	6.00	No. 04 100 links	3.50	4.50

Electric Reel without tape, for 50 and 100 feet, each	$1.50
Electric Reel without tape for 200 feet, each	2.00
Extra detachable brass rings, per pair	.30

For prevailing prices see latest supplementary price list.

LUCAS STEEL CHAIN TAPES

Highest grade steel used and all plated with the best anti-rust coating. Made in two widths, 1/8 and 15/64 inch. Above cut plainly shows the abuse the "Lucas" steel tape will stand and yet re-straighten without breaking.

For prices see the next page.

MAINTENANCE OF WAY CHAIN TAPES

"LUCAS" STEEL CHAIN TAPES

No. 311 Tape on No. 601 Reel.

No. 606 Reel.

Order by Number Only. All Tapes Listed without Reels

Tapes 15/64 inch wide

Banded, Graduated and Figured every 5 feet, all intermediate feet marked by small brass rivets, each end foot to 10ths of a foot.

No. 310— 50 feet..... $2.50
No. 311—100 feet..... 4.00

Tapes 15/64 inch wide

Banded, Graduated and Figured every foot, each end foot to 10ths of a foot.

No. 321—100 feet..... $7.00

Tapes 15/64 inch wide

Banded, Graduated and Figured every 5 links, all intermediate links marked by small brass rivets, each end link to 10ths.

No. 411—100 links..... $3.50
No. 412—200 links..... 6.75

Tapes ⅛ inch wide

Banded, Graduated and Figured every foot, each end foot to 10ths of a foot.

No. 331—100 feet..... $6.50

Tapes ⅛ inch wide

Banded, Graduated and Figured every 5 feet, all intermediate feet graduated (not figured) on short bands, each end foot to 10ths of a foot.

No. 341—100 feet..... $5.50
No. 342—200 feet..... 10.00
No. 343—300 feet..... 14.50
No. 345—500 feet..... 23.00

Tapes ⅛ inch wide

Banded, Graduated and Figured every 50 feet, each end 50 feet to 10 feet, each end 10 feet to feet, each end foot to 10ths of a foot.

No. 391—1000 feet..... $25.00

Pair of strong Key Ring Handles furnished with every Tape.

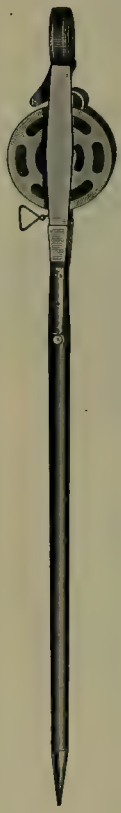
"LUCAS" PRACTICAL REELS

No. 601 Improved Cast Brass Frame Reel, for tapes 15/64 to 9/32 inch wide, 50 to 100 feet long (see cut). Weight, 25 ounces $2.00

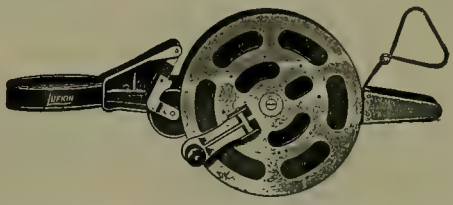
No. 602, same as No. 601, but for tapes ⅛ inch wide, 50 to 100 feet long. Weight, 25 ounces..... 2.00

No. 606 Sheet Steel Reel, will take 300 feet of 15/64 inch or 500 feet of ⅛ inch tape; made from 1/16 inch steel, all parts plated, large folding handle, stop and tension spring, practical and durable. (See cut.) Weight, 56 ounces 7.00

For prevailing prices see latest supplementary price list.



THE "CRIPPLE CREEK" REEL



Aluminum frame 14 inches long; nickel-plated steel reel 8 inches in diameter. A hardwood roller or spool is fitted between the sides or discs of reel which by means of a spring presses toward the axis of reel, causing the tape to wind up evenly and tightly and keeping it in place. Long, neat and strong aluminum winding handle with large metal finger hold, giving a winding leverage of nearly five inches, and enabling the winding of a long tape with exceptional ease and rapidity. A leather strap for carrying is attached to one end of the frame.

The Cripple Creek Reel is the neatest, lightest, most convenient, easiest working and most durable reel for long steel tapes made. Weight, 4½ lbs.

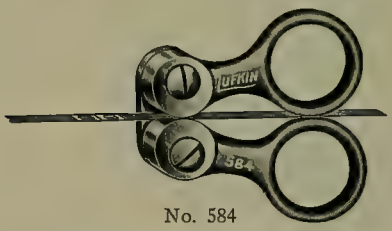
Price of Cripple Creek Reel.....Each, $12.50

STAFF FOR CRIPPLE CREEK REEL

Forty inches long, of hard maple wood; aluminum socket with heavy set screw at one end into which the reel fits and is securely fastened. Other end of staff is tapered by means of a heavy brass ferrule and steel point which can be firmly set into the ground. The great advantage of this staff is that it serves as a complete support in winding or unwinding the tape, and when the reel is not in use, the outfit can be conveniently carried over the shoulder. Weight, 2¼ lbs.

This staff is very strong, but light and very convenient.

Price of Staff only.....Each, $2.00



No. 584

CLAMP HANDLES

For attaching to any part of a long steel tape, thus enabling one to adapt it to any desired length. Brass, nicely nickel plated.

No. 584—Wt. 4 oz. Each, $1.50

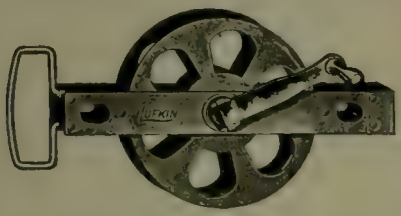
EXTRA SWIVEL HOOKS AND LEATHER THONGS

No. 585 Extra Swivel Hooks for Chain Tapes .....Each, $0.15
No. 586 Extra Rawhide Thongs for Chain Tapes.....Pair, .50

For Tape Repair Outfits see pages 206 and 207.

For prevailing prices see latest supplementary price list.

THE 1914 REEL



The No. 1914 Reel, illustrated above, is an all-steel reel and is constructed in such a manner that it will withstand the most severe usage. The frame is 14 inches long, the winding handle 5 inches long, thus enabling the winding of a long tape with exceptional ease and rapidity. The handle is flush folding and locks into either end of the frame. For convenience in carrying and winding in tape, a metal handle is attached to one end of the frame. This reel can be used with any of our Chain Tapes.

In ordering, always state what length, width and style of tape is to be used with reel.

Prices of No. 1914 Reels

For tapes 100 to 200 feet long.....Each, $7.00
For tapes 300 to 500 feet long.....Each 8.00

Weight each, approximately, 3½ lbs.

SURVEYORS' CHAINS

Before ordering see Tapes, pages 190 and 191.

No. 600	Iron Chain, brass handles, No. 8 wire, 33 feet	$2.60
No. 601	" " " " 50 "	3.25
No. 602	" " " " 66 "	4.00
No. 603	" " " " 100 "	5.25
No. 604	Steel Chains, " No. 10 " 33 "	3.50
No. 605	" " " " 50 "	4.25
No. 606	" " " " 66 "	6.50
No. 607	" " " " 100 "	8.00
No. 608	Steel Chains, brazed links and ring, No. 12 wire, 33 feet	5.50
No. 609	" " " " " 50 "	6.00
No. 610	" " " " " 66 "	10.00
No. 611	" " " " " 100 "	11.00

For prevailing prices see latest supplementary price list.

POCKET MEASURING TAPES

LUFKIN STEEL TAPES

Standard of Measurements

Lufkin Steel Tapes are so carefully graduated by Standards supplied by the United States Government that they can be used for testing the accuracy of other tapes.

Tension:

Lufkin Steel Tapes are made under a tension of 10 pounds for tapes up to 100 feet in length and 20 pounds if longer. They are accurate when supported full length at this tension.

Temperature:

Steel tapes graduated in customary English units (feet, inches, etc.) are standard at a temperature of 62° Fahrenheit. The National Bureau of Standards recommend tapes graduated in the Metric System be made Standard at 20° Centigrade, this being the normal temperature under which they are used. We are prepared to make them at 20° Centigrade if so desired, but unless otherwise specified, we will make them accurate at 0° Centigrade, which is the customary Standard for Countries that have adopted the Metric System.

CERTIFICATE OF COMPARISON OF THE NATIONAL BUREAU OF STANDARDS AT WASHINGTON, D. C.

We can furnish a certificate of comparison of the National Bureau of Standards for any Lufkin Steel Tape the graduations of which are marked directly on the steel and the zero of the graduations is represented by a line marked on the tape. The fees of the Bureau of Standards for comparisons are given below, to this must be added the transportation charges to and from Washington, D. C.

(A)	For total length, not greater than 100 feet or 50 meters, either supported throughout or at intervals	$0.75
	For each additional 100-foot or 50-meter interval	.50
(D)	For comparing total length both supported throughout and at intervals for length of 100 feet or 50 meters	1.25
	For each additional 100 feet or 50 meters	1.00
(F)	For each sub-division compared	.10
(G)	For determination of length at an additional tension, for each 100-foot or 50-meter interval	.25
(H)	For determining the tension to the nearest 0.5 pound or 0.25 kilogram at which the tape is most nearly correct at the standard temperature, for each 100-foot or 50-meter interval	.50
	For tapes not sent on a reel there will be an additional charge for each 100-foot or 50-meter length or fraction thereof of	.25

The Bureau of Standards certificate states the temperature at which the comparison was made, the method of support, the tension used in making comparison, and the length corrected for the standard temperature. The number of each certificate is also etched on the tape.

INSTANTANEOUS READINGS

Instantaneous Readings, a patented system of marking steel and metallic tapes, consists of repeating the foot marks at every inch in small, yet easily distinguishable figures. Thus the total reading is brought directly before the eye, eliminating all chance of possible error, and saving valuable time.

ENGINEERS' PATTERN STEEL TAPES

Leather Cases

Instantaneous Readings

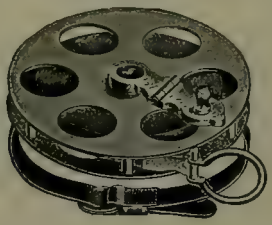
Metal-lined hard leather cases, nickel-plated trimmings, folding flush handle, opened by pressing pin on opposite side, two detachable rings. The tape can be readily detached from case, and we furnish an extra ring for the other end. The steel is heavier and stronger than used in the regular steel tapes, and the cases are thinner. Tapes ¼-inch wide.

Marked Feet and 12ths (Inches and Eighths)	Marked Feet, 10ths and 100ths of feet, for Surveyor's Use	Length	Weight Ounces	Each
No. 231	No. 231 D	33 ft.	13	$5.00
" 233*	" 233 D	50 "	17	6.00*
" 234	" 234 D	66 "	21	8.00
" 235	" 235 D	75 "	22	9.50
" 236*	" 236 D	100 "	27	12.00*

Tapes divided metric system on back add 2c per foot.

"WOLVERINE" STEEL TAPES

Instantaneous Readings



Open metal reel, with nickel-plated brass folding handle. Leather strap on the reverse side, by which the tape can be firmly held when winding. This reel is very strong, and is built to withstand the most severe usage. The metal is given a satin finish, which presents a beautiful appearance. With ¼-inch Engineers' Pattern Steel Tapes.

Marked Feet and 12ths (Inches and Eighths)	Marked Feet, 10ths and 100ths of feet, for Surveyor's Use	Length	Each
1373*	1373 D	50 ft.	$7.00*
1376*	1376 D	100 "	12.00*

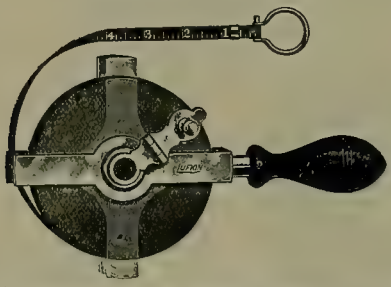
For prices of Lines only, see page 201.

*For extra heavy lines, see page 188.

For prevailing prices see latest supplementary price list.

ENGINEERS' PATTERN FRAME STEEL TAPES

Instantaneous Readings



Metal frames and trimmings, polished hardwood handles, two detachable rings. The tape can be readily detached from frame, and when so detached, the frame can be conveniently carried in pocket.

Tapes less than 100 feet are put up on two-arm frames; tapes 100 feet and longer are put up on four-arm frames.

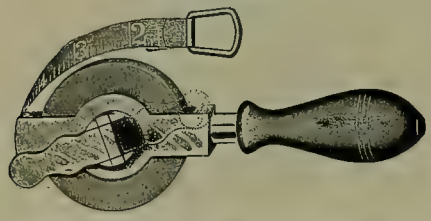
With One-quarter-Inch Heavy Tapes

Marked Feet and 12ths (Inches and Eighths)	Marked Feet, 10ths and 100ths of feet, for Surveyor's Use	Length	Each
No. 273	No. 273D	50 ft.	$5.25
No. 275	No. 275D	75 ft.	7.50
No. 276	No. 276D	100 ft.	9.00

Tapes marked links on back add 1c per foot.
Tapes marked metric on back add 2c per foot.

PHOSPHOR BRONZE TAPES

Nickel Plated



These tapes are particularly adapted to classes of work where a steel tape is affected by gases, salt water, acids, etc. Guaranteed not to rust. Made in 50- and 100-ft. lengths, ⅜ and ½ inch wide and put up in lock-handle frames.

With ⅜-inch tapes, rings attached.

Marked Feet and 12ths (Inches and Eighths)	Marked 10ths and 100ths of feet	Length	Each
No. 1283X	No. 1283DX	50 ft.	$8.50
No. 1286X	No. 1286DX	100 ft.	15.75

For similar tapes with plumb bob attachment see Nos. 1280XWB-1283XWB on page 201.

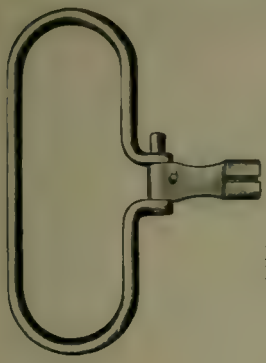
With ½-inch tapes, rings attached.

Marked Feet and 12ths (Inches and Eighths)	Marked 10ths and 100ths of feet	Length	Each
No. 1293X	No. 1293DX	50 ft.	$9.25
No. 1296X	No. 1296DX	100 ft.	17.00

For Phosphor Bronze Tapes in cases and with diameter measurements, see page 204.

For prevailing prices see latest supplementary price list.

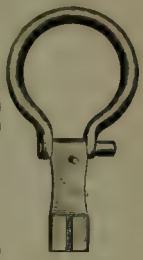
ATTACHMENTS FOR ENGINEERS' TAPES



No. 651

EXTRA DETACHABLE RINGS OR HANDLES

	Per Pr.
No. 650—1 in. round	$0.50
No. 651—3 in. oval	1.00

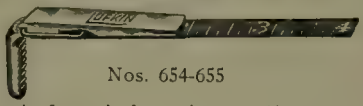


No. 650

TAPE HOOKS

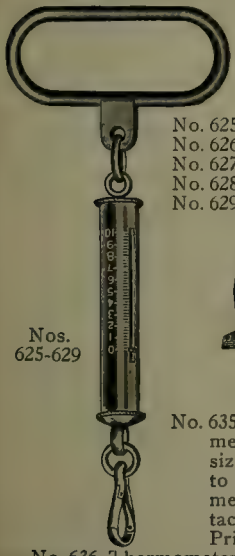
For attaching to steel tapes.
Measures from inside of hook.

No. 654 For ¼-inch tapes. Ea., $0.60
No. 655 For ⅜-inch tapes. Ea., .60



Nos. 654-655

This hook when attached to the first end of a steel tape enables one steadily to take long as well as short measurements readily.



Nos. 625-629

TENSION HANDLES

For applying exact tension at which a steel tape is standard. Brass, nickel plated.

	Capacity	Diam. and Length	Each
No. 625	20 lbs. by ½ lbs.	⅝ in. by 4¾ in.	$2.50
No. 626	30 lbs. by ½ lbs.	⅝ in. by 4⅛ in.	2.50
No. 627	40 lbs. by ½ lbs.	¾ in. by 8 in.	2.75
No. 628	50 lbs. by ½ lbs.	⅞ in. by 9 in.	3.00
No. 629	60 lbs. by ½ lbs.	⅞ in. by 9½ in.	3.25

McCULLOUGH TAPE LEVEL

No. 635

No. 635 McCullough Tape Level insures accuracy in measurements with steel tapes. Above cut full size. Weight, one ounce. It is used by clamping to the tape, about one foot from the handle, by means of the two springs shown, and can be attached and detached instantly.
Price $1.00

No. 636 Thermometer and Level in nickel-plated case to attach to tape at any point $3.00

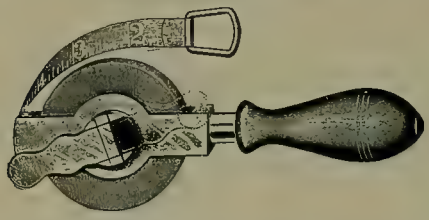
Temperature Scales furnished on new tapes. For 100-foot tape.... 1.00
For 200-foot tape 1.50
For 300-foot tape 2.00

For Pocket Thermometers see pages 145 and 162.

For prevailing prices see latest supplementary price list.

LOCK HANDLE FRAME STEEL TAPES

Instantaneous Readings



The frames of these tapes are fitted with a folding lock handle, which folds over the tape, enabling one to stop it at any desired length. This handle, on account of its length, also affords increased winding leverage, which, together with the large knob, makes it especially convenient and easy winding.

With ¼-Inch Engineer's Pattern Tapes, Detachable Rings

Marked Feet and 12ths (Inches and Eighths)	Marked Feet 10ths and 100ths of feet, for Surveyor's Use	Length	Each
No. 1270	No. 1270 D	25 ft.	$3.50
" 1271	" 1271 D	33 "	4.25
" 1273	" 1273 D	50 "	5.25
" 1274	" 1274 D	66 "	6.25
" 1275	" 1275 D	75 "	7.50
" 1276	" 1276 D	100 "	9.00

No. 1276, 100-foot Tape listed above, is supplied with 4-arm frame.

With ⅜-Inch Tapes, Rings Attached

No. 1280	No. 1280 D	25 ft.	$3.00
" 1281	" 1281 D	33 "	3.50
" 1283*	" 1283 D*	50 "	4.50
" 1284	" 1284 D	66 "	5.25
" 1285	" 1285 D	75 "	6.25
" 1286*	" 1286 D*	100 "	7.75

With ½-Inch Tapes, Rings Attached

No. 1293*	No. 1293 D*	50 ft.	$5.25
" 1296*	" 1296 D*	100 "	9.00

For prevailing prices see latest supplementary price list.

Tapes marked metric measure one side only, same price as corresponding length in feet.

Tapes marked feet one side, metric measure on the other, add 2 cents per foot to list price.

*These tapes can be furnished with our special Non-Rust Phosphor Bronze lines. See page 198.

OIL MEASUREMENT TAPES

With plumb bob attachment for gauging oil in tanks. This attachment is included in the measurement of the tape supplied. The Tapes are provided with a snap for detaching from bob when not in use.

IN LOCK HANDLE FRAMES

With ¼-Inch Tapes

No. 1270WB—25 feet, divided feet, inches and eighths	$5.00
No. 1271WB—33 feet, divided feet, inches and eighths	5.75
No. 1273WB—50 feet, divided feet, inches and eighths	6.75

With ⅜-Inch Tapes

No. 1280WB—25 feet, divided feet, inches and eighths	$4.50
No. 1281WB—33 feet, divided feet, inches and eighths	5.00
No. 1283WB—50 feet, divided feet, inches and eighths	6.00

With ⅜-Inch Lietz Special Tapes

These tapes are made of Phosphor Bronze.
Guaranteed not to rust or be affected by acids, etc.

No. 1280XWB—25 ft., divided feet, inches and eighths	$6.50
No. 1281XWB—33 ft., divided feet, inches and eighths	7.65
No. 1283XWB—50 ft., divided feet, inches and eighths	10.00

STEEL TAPES WITHOUT CASES

When ordering please state whether tape divided in 12ths or 10ths and 100ths is wanted.

Light, One-quarter Inch

For "Reliable Junior," "Challenge Junior," and "Rival Junior" Tapes.

	25 ft.	50 ft.	75 ft.	100 ft.
Marked one side	$2.25	$2.75	$3.50	$4.50
Marked two sides	2.75	3.75	5.00	6.50

Heavy, One-quarter Inch

For Engineers' Pattern, Engineers' Frame, Lock Handle, and Wolverine Tapes.

	33 ft.	50 ft.	66 ft.	75 ft.	100 ft.
Marked one side	$3.25	$4.00	$5.00	$6.00	$7.50
Marked two sides	3.90	5.00	6.30	7.50	9.50

Three-eighths Inch

For "Challenge," "Rival," "Reliable," and Lock Handle Tapes.

	25 ft.	33 ft.	50 ft.	66 ft.	75 ft.	100 ft.
Marked one side	$2.40	$2.60	$3.00	$3.75	$4.00	$5.25
Marked two sides	2.90	3.25	4.00	5.05	5.50	7.25

REPAIRS TO STEEL TAPES

We are prepared to give prompt and satisfactory service.

*Repairing Pocket Tapes—per break	$0.35
New End Ring, ordinary type	.15
New End Ring, Engineers' Pattern	.25
Extra Tape furnished, per foot	.10
Repairing Band Chains, per break	.50
New End Ring for Band Chains	.25
Resoldering and numbering first foot	1.00
Extra Tape furnished, per foot	.10

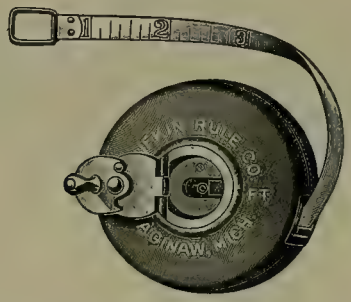
*Pocket Spring Steel Tapes cannot be mended except at ends.

For prevailing prices see latest supplementary price list.

"RELIABLE" STEEL MEASURING TAPES

Instantaneous Readings

⅜-Inch Tapes

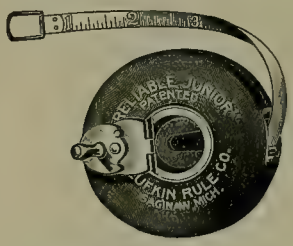


Marked Feet and 12ths (Inches and Eighths)	Marked Feet, 10ths and 100ths of feet, for Surveyor's Use	Length	Diameter of Case	Each
No. 200	No. 200 D	25 ft.	2¾ in.	$4.50
" 203	" 203 D	50 "	3¼ "	7.20
" 205	" 205 D	75 "	4¼ "	10.40
" 206	" 206 D	100 "	4½ "	12.80

RELIABLE JUNIOR TAPES

Instantaneous Readings

¼-Inch Tapes



Marked Feet and 12ths	Marked Feet, 10ths and 100ths	Length	Each
No. 100	No. 100 D	25 ft.	$3.75
" 103*	" 103 D*	50 "	4.60*
" 105	" 105 D	75 "	6.60
" 106	" 106 D	100 "	7.00

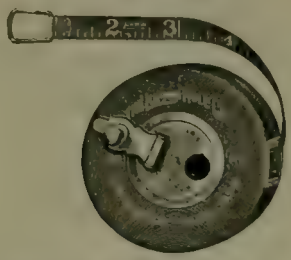
*No. 103 can be furnished marked feet and 12ths on one side and feet and 100ths on the back. Order by No. 103DOB..... $5.60

For prevailing prices see latest supplementary price list.

CHALLENGE STEEL MEASURING TAPES

Instantaneous Readings

⅛-Inch Tapes



Marked Feet and 12ths (Inches and Eighths)	Marked Feet, 10ths and 100ths of feet, for Surveyor's Use	Length	Diameter of Case	Each
No. 260	No. 260 D	25 ft.	2¾ in.	$3.25
" 263*	" 263 D*	50 "	3¼ "	4.00*
" 265	" 265 D	75 "	4¼ "	5.25
" 266*	" 266 D*	100 "	4½ "	6.75*

*Nos. 263 and 266 can be furnished marked feet and 12ths on one side and feet and 100ths on the back or with metric measure on back.

No. 263DOB— 50 feet (decimals)	$5.00
No. 263MOB— 50 feet (metric)	5.00
No. 266DOB—100 feet (decimals)	8.75
No. 266MOB—100 feet (metric)	8.75

CHALLENGE JUNIOR STEEL MEASURING TAPES

Instantaneous Readings

¼-Inch Tapes

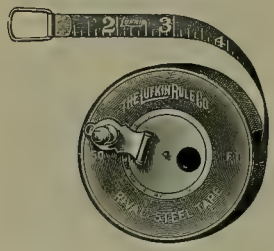
Marked Feet and 12ths (Inches and Sixteenths)	Marked Feet, 10ths and 100ths of feet, for Surveyor's Use	Length	Diameter of Case	Each
No. 1260	No. 1260 D	25 ft.	2¼ in.	$3.00
" 1263*	" 1263 D*	50 "	2⅞ "	3.50*
" 1265	" 1265 D	75 "	3⅜ "	4.50
" 1266	" 1266 D	100 "	3¾ "	5.75

*No. 1263 can be furnished marked feet and 12ths on one side and feet and 100ths on the back or with metric measure on back.

No. 1263DOB—50 feet (decimals)	$4.50
No. 1263MOB—50 feet (metric)	4.50

"RIVAL" STEEL MEASURING TAPES

Instantaneous Readings
⅜-Inch Tapes

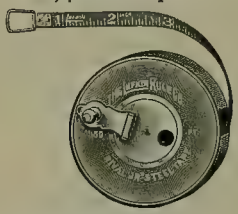


Nickel-plated steel cases, folding flush handle, opened by pressing pin on opposite side. Cases have knurled edges, which afford a firm hold when winding in tape. Measurements guaranteed accurate.

Marked Feet and 12ths (Inches and Eighths)	Marked Feet, 10ths and 100ths of feet, for Surveyor's Use	Length	Each
No. 240	No. 240 D	25 ft.	$2.75
" 243	" 243 D	50 "	3.40
" 246	" 246 D	100 "	5.75

"RIVAL JUNIOR" STEEL MEASURING TAPES

Instantaneous Readings
¼-Inch Tapes



Marked Feet and 12ths (Inches and Eighths)	Marked Feet, 10ths and 100ths of feet, for Surveyor's Use	Length	Each
No. 1240	No. 1240 D	25 ft.	$2.50
" 1243	" 1243 D	50 "	3.00
" 1246	" 1246 D	100 "	5.00

RIVAL TAPES WITH DIAMETER MEASUREMENTS

These tapes are marked on one side in feet, inches and 8ths, other side with diameter measurements in feet, enabling one, by measuring the circumference, to arrive at the exact diameter as fine as 64ths of inches.

No. 241P—"Rival," 33 feet with diameter measurement	$3.60
No. 243P—"Rival," 50 feet with diameter measurement	4.40
No. 1243P—"Rival Junior," 50 feet with diameter measurement	4.00
No. 241XP—Lietz Special Non-Rust, Non-Breakable Tape, in "Rival" Case, 33 feet, with diameter measurement	6.00
No. 243XP—Like No. 241XP but 50 feet	7.40

"BANNER" STEEL MEASURING TAPES

Instantaneous Readings—⅜-Inch Tapes

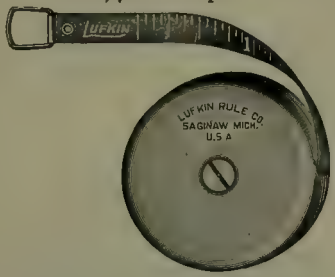
Cases made of steel, covered with handsome mottled black "Autoleather," extremely durable. Fitted with folding flush handle, opened by pressing button on opposite side. Trimmings nickel plated.

Graduated in Feet, Inches and Eighths only

No. 550— 25 feet	$2.30
No. 553— 50 feet	2.85
No. 556—100 feet	4.75

POCKET SPRING STEEL TAPES

¼-Inch Tapes



Round Edge Nickel-Plated Brass Cases, Spring Wind, Center Stop

Marked One Side Only; Inches and 16ths

No. 143—36 inches, ¼-inch Tape	Each	$0.55
" 145—60 " ¼ " "	"	.70
" 146—72 " ¼ " "	"	.80
" 148—96 " ¼ " "	"	1.10

Marked Inches and 16ths One Side; Feet, 10ths and 100ths Other Side

No. 143D—36 inches, ¼-inch Tape	Each	$0.65
" 145D—60 " ¼ " "	"	.80
" 146D—72 " ¼ " "	"	.95
" 148D—96 " ¼ " "	"	1.25

Marked Inches and 16ths One Side; Millimeters Other Side.

No. 143EM—36 inches, 1 meter, ¼-inch Tape	Each	$0.65
" 145EM—60 " 1½ " ¼ " "	"	.80
" 146EM—72 " 2 " ¼ " "	"	.95
" 148EM—96 " 2½ " ¼ " "	"	1.25

Extra Long Pocket Spring Steel Tapes

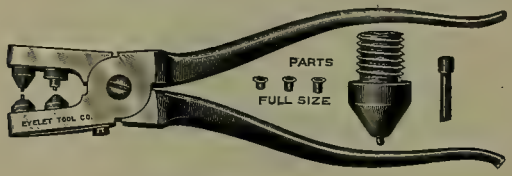
German Silver Cases, Spring Wind, Center Stop.

No. 1512D Marked inches on one side, 100ths on other, 12 ft	$2.75
No. 1525D Marked feet and 100ths one side only, 25 ft	4.50

For Pocket Spring Linen Tapes see page 208.

For prevailing prices see latest supplementary price list.

TAPE REPAIRING OUTFITS



No. 675

Eyelet Punch and Set combined for repairing steel tapes: Tool, socket, punching pin and three sizes eyelets, shorts, longs and extra longs. Cuts clean hole through pocket steel tapes or band chains without drawing temper; no filing required except to round off the rough corners of the break. Cut first hole, place eyelet on pivot and insert in hole cut, and it is riveted quickly. Five minutes required to make a repair.

No. 675 Tape Mending Outfit complete, with 1M assorted eyelets...	$4.00
No. 675A Extra Eyelets (when ordering state if Shorts or Longs are wanted) 500 in a package. Price per 1000.....	1.25
No. 675B Extra Male Punching Dies.....	.50
No. 675C Extra Male Setting Dies.....	.40
No. 675D Extra Female Dies.....	.40
No. 675E Extra Punching Pins	.20
No. 675F Extra Escutcheon Pins. Per oz.	.10

SPECIAL LIETZ TAPE REPAIRING OUTFIT

No. 680 The Lietz Senior Outfit will repair any band chain or tape; contains a Mender No. 675 complete, one extra Male Die No. 675B, 2 extra Punch Pins No. 675E, Escutcheon Pins, 1 dozen assorted Lucas Tape Splices with 1 tube of Solder, 1 pair of Heavy Snips, 1 5-inch File, Riveting Set and Center Punch, Cutting Pliers, Hammer, Steel Anvil, Cloth, Oil and extra pieces of Tape, all in neat Pegamoid pouch. Complete $10.00

For prevailing prices see latest supplementary price list.

QUICK TAPE REPAIR BANDS

No. 685 **"LUCAS" QUICK TAPE REPAIR BANDS** furnished with "Lucas" Special Flux, recommended to be most satisfactory as soldering material does not deteriorate, packed one dozen in a box for 1/8, 3/16, 15/64, 1/4, 9/32, and 5/16 inch tapes. State width desired when ordering.

Price per box, with tube of solder $0.50

No. 685A Extra solder, per tube ..... .15

No. 686 **EUREKA TAPE REPAIR BANDS,** one dozen in small wooden box, for 1/8, 3/16, 1/4, 3/8, 1/2 inch Tapes. State width desired when ordering. These splices are coated with a combination of solder and flux, and a lighted match will bring about perfect adhesion between the tape and sleeve.
Price per box $0.50

TAPE SPLICES

No. 690

No. 690 "Little Giant" Tape Splice for 1/8, 3/16, 1/4, 5/16, 3/8, 15/64 and 1/2 inch tapes. Each $0.40

To repair breaks insert broken ends, adjust by sight hole and turn down screws. Will withstand strongest pull.

For prevailing prices see latest supplementary price list.

METALLIC MEASURING TAPES

Flush Handle
Instantaneous Readings
⅝-Inch Tapes

Hard leather cases, double folding flush handle, opened by pressing pin on opposite side. Tape ⅝ inch wide, made of best woven linen, with metallic warp. We guarantee our Metallic Tapes to be the best, and less liable to shrink or stretch than any others.

Marked One Side, Feet and 12ths	Marked One Side, Feet and 100ths	Length	Each
No. 603	No. 603 D	50 ft.	$2.80
" 606	" 606 D	100 "	4.20

JUNIOR METALLIC MEASURING TAPES

Flush Handle
⅜-Inch Tapes

Hard leather cases, nickel-plated trimmings, double folding flush handle, opened by pressing pin on opposite side. Tape is made of best woven linen with metallic warp. Marked one side only in 10ths or 12ths.

The Junior Metallic is a companion to our popular "Reliable Junior" and is less than one-half the size and weight of a regular Metallic Tape.

Marked One Side, Feet and 12ths	Marked One Side, Feet and 100ths	Length	Each
No. 660	No. 660 D	25 ft.	$1.80
" 663	" 663 D	50 "	2.25

POCKET LINEN TAPES

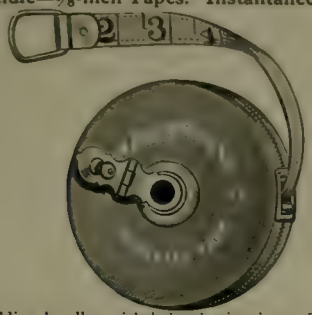
Round Edge Nickel-Plated Brass Cases, Spring Wind, Center Stop With One-quarter Inch Enameled Linen Tapes

Marked Inches and 8ths One Side Only.	Each
No. 173—36 inches	$0.30
No. 175—60 inches	.35
No. 176—72 inches	.40

For prevailing prices see latest supplementary price list.

METALLIC MEASURING TAPES

Folding Handle—5/8-inch Tapes. Instantaneous Readings



Hard leather cases, folding handles, nickel-plated trimmings. Tape 5/8 inch wide, made of best woven linen with metallic warp. We guarantee our Metallic Tapes to be less liable to shrink or stretch than any others.

Marked One Side Only

Marked Feet and 12ths	Marked Feet and 100ths	Length	Each
No. 500	No. 500 D	25 ft.	$1.70
" 503	" 503 D	50 "	2.50
" 505	" 505 D	75 "	3.10
" 506	" 506 D	100 "	3.90

Marked Two Sides

Feet and 100ths, and Links on back	Feet and 12ths, and Centimeters on back	Length	Each
No. 503 DL	No. 503 ME	50 ft. or 15 meters	$2.60
.....	" 505½ ME	25 "	3.60
" 506 DL	" 506 ME	100 ft. or 30 "	4.20

Tapes marked with feet on back instead of links, or with any two measurements listed above, will be supplied at prices of corresponding tapes marked both sides.

METALLIC TAPE REFILLS

JUNIOR METALLIC TAPE LINES ONLY, WITHOUT CASES

3/8 Inch Wide

Marked Feet and 12ths	Marked Feet and 100ths	Length	Each
No. 0660	No. 0660 D	25 ft.	$0.75
" 0663	" 0663 D	50 "	1.25

METALLIC TAPE LINES ONLY, WITHOUT CASES

5/8 Inch Wide—Marked One Side Only

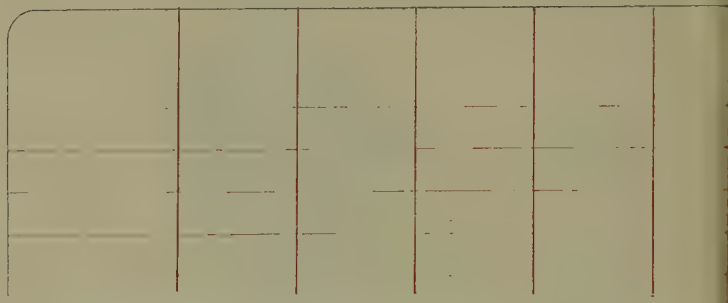
Marked Feet and 12ths	Marked Feet and 100ths	Marked Metric	Length Feet	Length Meters	Each
No. 0500	No. 0500 D	.....	25	.....	$0.80
" 0503	" 0503 D	0503 M	50	15	1.40
" 0505	" 0505 D	.....	75	.....	1.80
.....	.....	0505½ M	.....	25	2.10
" 0506	" 0506 D	0506 M	100	30	2.60

Marked Two Sides

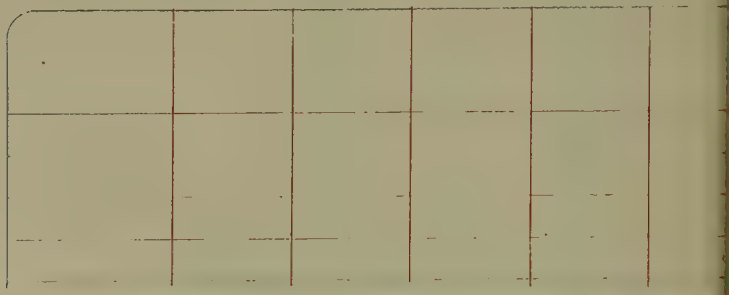
Marked Feet and 100ths, Links on Back	Marked Feet and 12ths, Centimeters on Back	Length Feet	Length Meters	Each
No. 0500 DL	.....	25	.....	$0.90
" 0503 DL	No. 0503 ME	50	15	1.50
" 0505 DL	.....	75	.....	2.00
.....	" 0505½ ME	.....	25	2.30
" 0506 DL	" 0506 ME	100	30	2.90

~~ALCO~~ ENGINEE

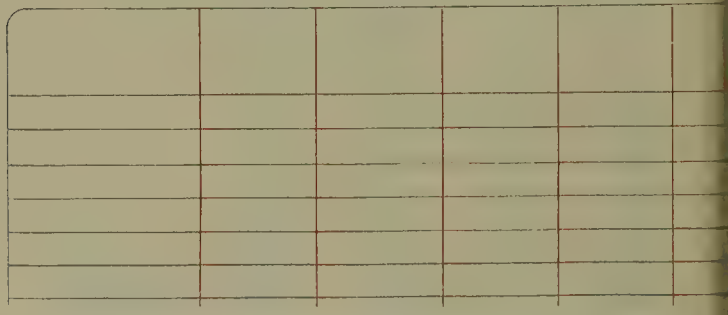
All of our Field Books contain stadia reduction tables, naturals and other handy ta and



No. 760 Field Book, 4½x7¼ in., 80 leaves .....
No. 761 Field Book, 4½x7¼ in., 60 leaves .....
No. 762 Field Book, 4 x6½ in., 80 leaves .....



No. 763 Mining Transit Book, 4½x7¼ in., 80 leaves, right-hand page 8x8 to the inch.



No. 764 Engineers' Field Book, 4½x7¼ in., 80 leaves, right-hand page 10x10 to the
No. 765, same as No. 764 but 4x6½ in., 80 leaves .....

WE MAKE SPECIAL FIELD BOOKS OF ANY DE

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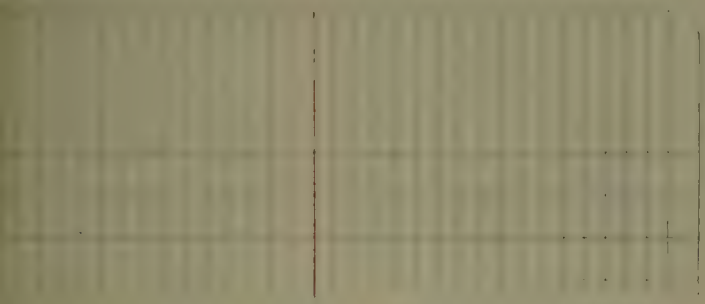
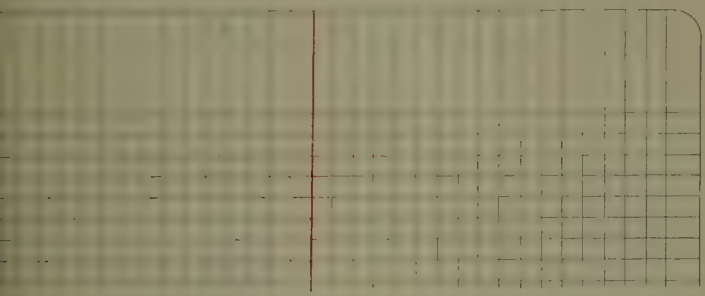
re well bound in strong leather covers, have sewed backs with cloth reinforcement at.



..... Per doz. $6.50. Each $0.65
..... Per doz. 5.50. Each .55
..... Per doz. 5.50. Each .55



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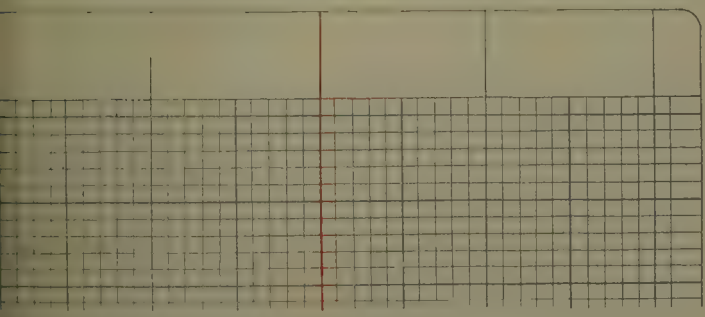

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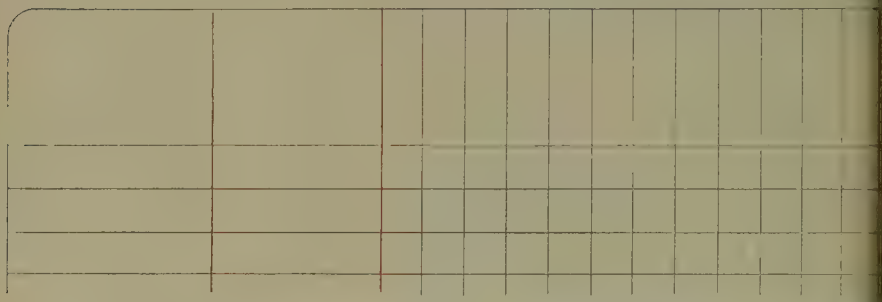
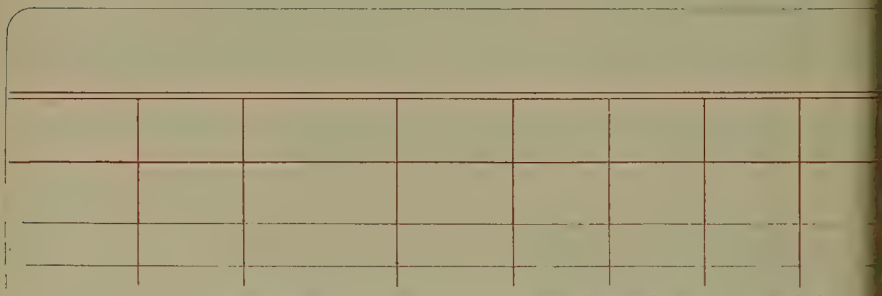
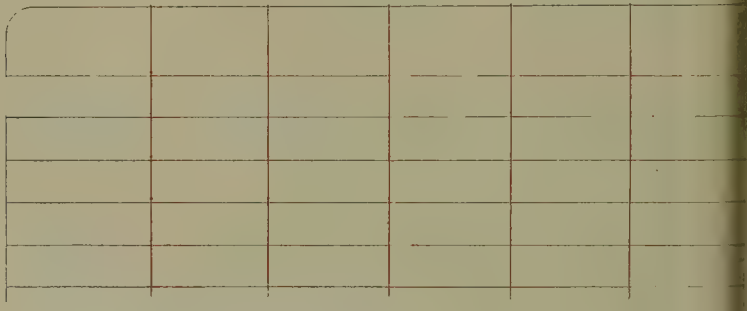


No. 766 Topographical Book, 4½x7¼ in., 80 leaves, 2 columns, and balance of page
NOTE—This book is used so that the long



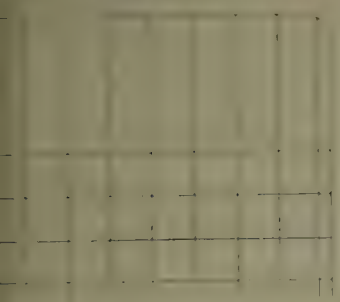
No. 768 Topographical Book, 5x8 in., 80 leaves, right-hand page 4x4 to the inch.....

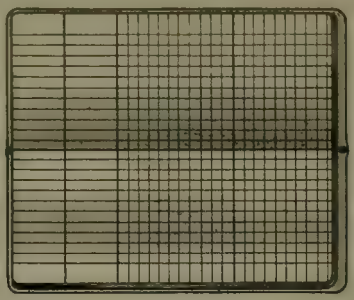


No. 770 Level Book, 4 x6½ in., 80 leaves .....
No. 771 Level Book, 4 x6½ in., 60 leaves .....
No. 772 Level Book, 4½x7¼ in., 80 leaves .....
No. 773 Level Book, 4½x7¼ in., 60 leaves .....

All our Field Books contain

ELD BOOKS





ıe inch ..... Per doz. $6.50. Each $0.65
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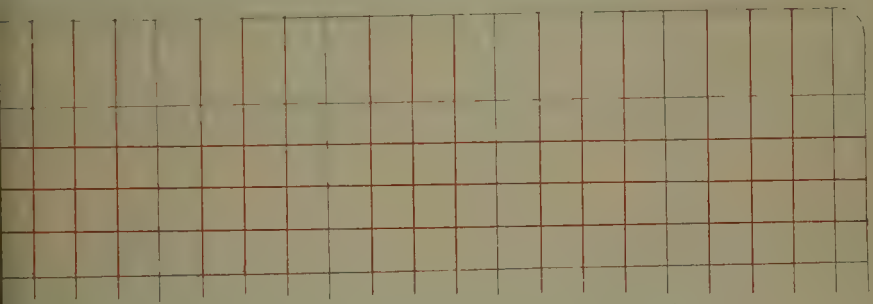

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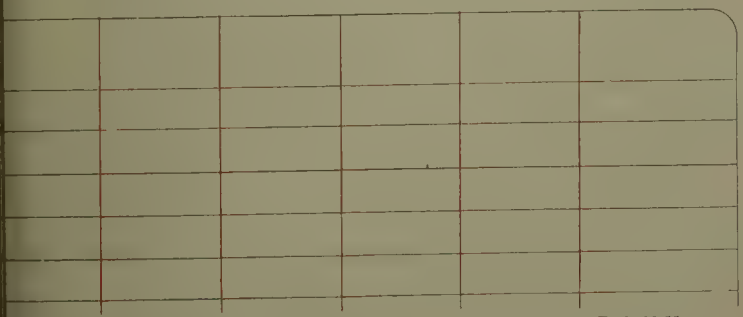

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..... Per doz. 6.00. Each .60
..... Per doz. 5.50. Each .55
ction tables, naturals, etc.

~~ALCO~~ ENGINEER

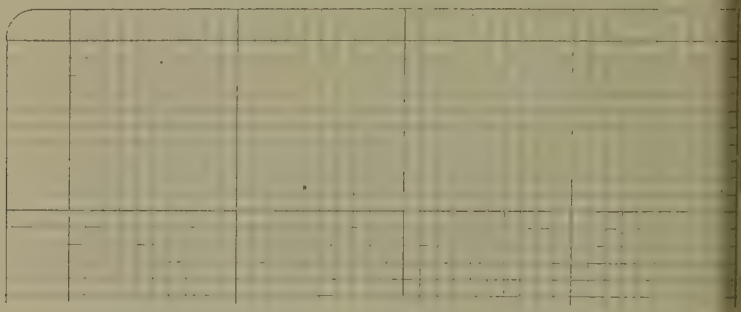
SECTION

STA.	ELEVA.	GRADE	CUT OR FILL		
			LEFT	C	RIGHT

No. 774 Earthworks Book, 5x8 in., 80 leaves .....

H. I.	Inst. Station	Back Sight	ANGLE		Needle	Vert. Angle	Slope Dist.
			Right	Double			

No. 775 Mining Record Book, 5x8 in., 80 leaves .....



No. 777 Cross-section Book, 4½x7¼ in., 80 leaves, 10x10 to the inch.....
No. 778 Cross-section Book, 5½x7½ in., 80 leaves, 10x10 to the inch.....
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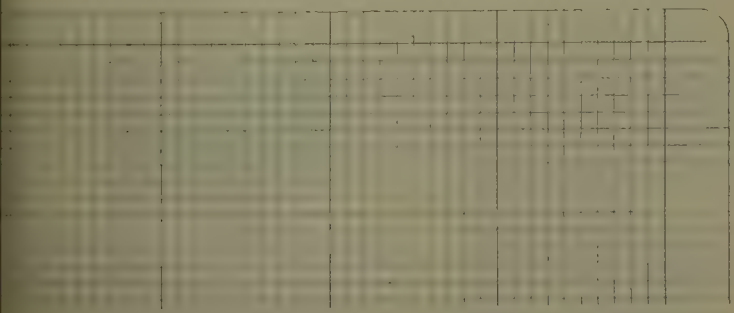
..... Per doz. $10.00. Each $1.00

Calc. Course	Hor. Dist.	Vert. Dist.	Elev. F. S.	Fore Sight	REMARKS

..... Per doz. $12.50. Each $1.25



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..... Per doz. 9.00. Each .90
..... Per doz. 11.50. Each 1.15

uction tables, naturals, etc.

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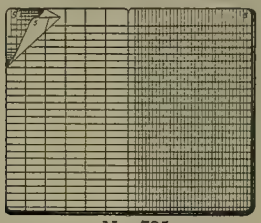
DUPLICATING FIELD BOOKS

The Duplicating Field Book fills a long felt want of civil and mining engineers where field parties are more or less distant from the office where the plotting is done. By making a single entry it enables the engineering corps in the field to furnish the home office with a duplicate sheet of their proceedings each day as the work progresses.

The books are well bound in strong leather covers and contain 80 original and duplicate sheets and 8 sheets of special pencil carbon paper that will produce perfect and clean copies. The originals are of white linen ledger paper and are permanently bound. The duplicates are of strong yellow Manilla paper and are perforated and punched for filing in our Office Record Binder No. 786.

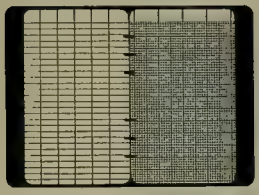


No. 785

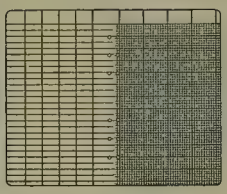
No. 785 Duplicating Field Book, 7½x4½, 80 each original and duplicate sheets ruled in red and blue like our No. 760-61 Field Books, with carbon paper.
Each, $1.00 Dozen, $10.75

No. 786 Office Record Binder, two stiff covers lined with waterproof cloth, with patented hinged rings, for filing duplicate sheets.
Each, $0.30 Dozen, $3.00

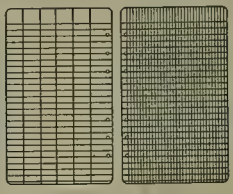
LOOSE LEAF ENGINEERS' FIELD BOOKS



No. 790



Illustrating Double Loose Leaf Sheets



Illustrating Single Loose Leaf Sheets

Loose Leaf Field Books are advantageous to engineers in many respects. They enable one to leave finished notes in the drafting room while the books are still being used in the field and to remove certain leaves if necessary. We offer the profession the following assortment. Our Field Binders Nos. 790 and 792 are made of extra heavy leather covered material and are very durable. The mechanism is strong and consists of six metal rings which are readily opened when necessary. The Office Binder No. 791 is made of strong cloth covered material with similar mechanism. It is intended for use in the office and for filing sheets. This binder can also be used in the field and has proven very satisfactory for this purpose. The leaves are ruled on extra heavy stock and are similar in design and colors to our regular field books.

COVERS

No. 790 Heavy leather covered Binder, 7¼x4½ with ½-inch rings.. $2.00
No. 791 Cloth covered Office Binder, 7¼x4½ with ½-inch rings ... 1.00
No. 792 Heavy leather covered Binder, 6½x8¼ with ½-inch rings (for large cross-section sheets Nos. 0779 and 0779D)..... 2.50

Loose Leaf Sheets and Filing Cabinets listed on the next page.

For Celluloid Field Books or Cruisers' Pads especially adapted for work in wet weather see page 132.

For prevailing prices see latest supplementary price list.

LOOSE LEAF SHEETS

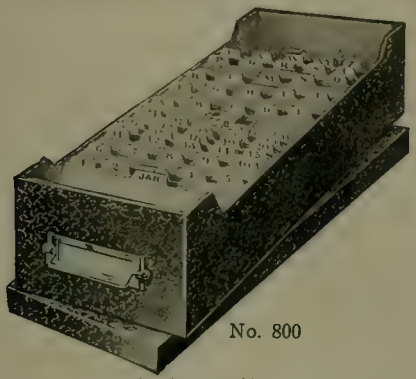
Loose leaves can be furnished in two styles, single sheets and double sheets. Single sheets are ruled on both sides and are used consecutively. Double sheets are ruled on one side only and the left and right hand pages of each record are joined.

No. 0760	Single Loose Leaf Sheets like Field Book No. 760.	Per 100.....	$0.60
No. 0760D	Double Loose Leaf Sheets like Field Book No. 760.	Per 100.....	1.20
No. 0763	Single Loose Leaf Sheets like Field Book No. 763.	Per 100.....	.60
No. 0763D	Double Loose Leaf Sheets like Field Book No. 763.	Per 100.....	1.20
No. 0764	Single Loose Leaf Sheets like Field Book No. 764.	Per 100.....	.60
No. 0764D	Double Loose Leaf Sheets like Field Book No. 764.	Per 100.....	1.20
No. 0772	Single Loose Leaf Sheets like Level Book No. 772.	Per 100.....	.60
No. 0772D	Double Loose Leaf Sheets like Level Book No. 772.	Per 100.....	1.20
No. 0777	Single Loose Leaf Sheets like Field Book No. 777.	Per 100.....	.60
No. 0777D	Double Loose Leaf Sheets like Field Book No. 777.	Per 100.....	1.20
No. 0779	Single Loose Leaf Sheets like Field Book No. 779.	Per 100.....	.75
No. 0779D	Double Loose Leaf Sheets like Field Book No. 779.	Per 100.....	1.50

GUMMED MUSLIN EYELETS

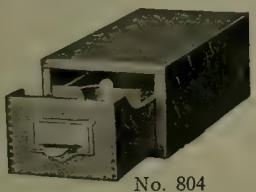
No. 798 Muslin Eyelets, gummed, for reinforcing holes of loose leaf sheets. Per 100 $0.15

FILING CASES FOR LOOSE LEAF SHEETS



No. 800

No. 800 Agate Filing Case, 11⅞ inches long outside, made of heavy binders' board with wood bottom, fitted with a steel follower which by slight pressure of lever can be released and moved forward or backward without friction. Equipped with 25 blank index cards 5x8..... $1.25

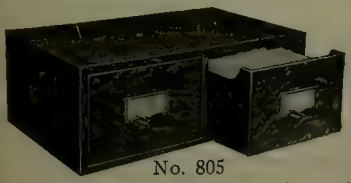


No. 804

No. 802 Peerless Filing Case, 10 inches long, hardwood, either oak or mahogany finish. Substantially made with lock-joint corners. Each tray fitted with steel follower and with quadrants for supporting lid. Equipped with 25 blank index cards 5x8. Oak finish..... 3.00

No. 802M Mahogany finish 3.50

No. 804 Utility Filing Case, single-drawer section, 12¾ inches deep outside, quartered oak, wax finish, durably built with lock joint corners, fitted with steel enameled follower. Furnished with 25 blank index cards 5x8 ..... 5.25

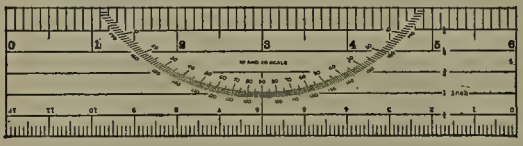


No. 805

No. 805 Utility Filing Case, two-drawer section, 12¾ inches deep outside. Complete with 25 blank index cards as No. 804 ..... 7.75

FIELD BOOK ACCESSORIES

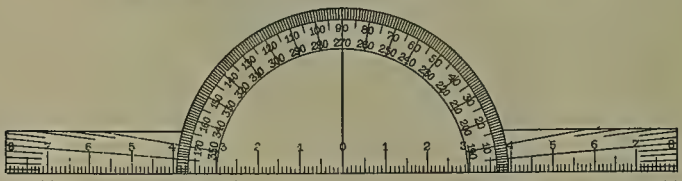
TRANSPARENT AMBER PROTRACTORS



	Each
No. 2260 Amber Parallel Ruler and Scale Protractor, 10x50 scales....	$0.25
No. 2261 Amber Parallel Ruler and Scale Protractor, 30x40x50 scales	.25
No. 2262 Amber Parallel Ruler and Scale Protractor, 20x40 scales....	.25
No. 2263 Amber Parallel Ruler and Scale Protractor, inch and metric scales	.25
No. 2264 Amber Parallel Ruler and Scale Protractor, inch and 10 scales	.25
No. 2265 Amber Parallel Ruler and Scale Protractor, ⅛, ¼, ½ and 1 inch scales	.25

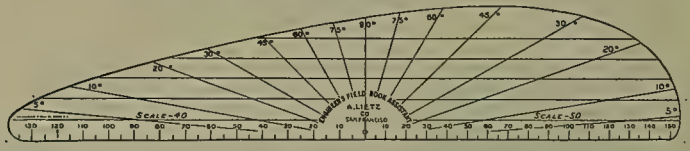
Above Protractors are made of transparent amber, 6 inches long. They combine the advantages of the scale and the protractor. Lines can be drawn at any desired angle or parallel to each other without measuring. Excellent for field book use. Can also be used for inscribing arcs or circles.

TRANSPARENT PLOTTING PROTRACTORS



No. 2255 Transparent Plotting Protractor, with arms 8 inches long; ea. $1.25

ENGINEERS' FIELD BOOK ASSISTANT



The Engineers' Field Book Assistant combines in itself a straight-edge, irregular curve, parallel ruler, protractor and scale. Made of thin transparent amber, about 6½ inches long.

No. 2256 Engineers' Field Book Assistant; each..... $0.50

FIELD BOOK PENCILS

No. 3778 Drawing Pencils, Flat, for use in field books, HB, 2H or 4H; dozen $1.25

For prevailing prices see latest supplementary price list.

ENGINEERS' FIELD BAGS

No. 815

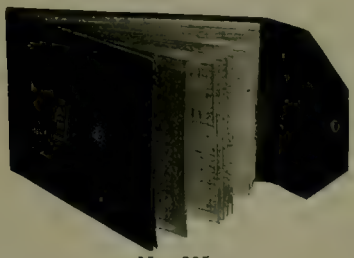
No. 815 Leather Carrying Bag for surveyors, 9x7x2½, with three compartments, each $3.75

No. 816 Canvas Carrying Bag for surveyors, 9x7x2½, with three compartments, each 2.75

STRAPS FOR CARRYING STAKES

No. 820 Webb Carrying Straps for carrying stakes, with buckle.... $0.60

PROFILE BOOKS



No. 825

No. 825-26 Continuous. Bound in Flexible Morocco Covers. These books are folded like a map to replace the continuous rolls of profile paper, and the pages are mounted on muslin. Each leaf or two pages facing contain six thousand feet—a "Section" as generally laid out for the construction of a road. Paper is of good quality and lies flat.

No. 825 Plate A. 4x20 to one inch. 5½x8 inches. Printed in green.

	12	25	50	100 miles
Each	$2.00	$3.25	$5.25	$9.50

No. 826 Plate B. 4x30 to one inch. 4¾x8 inches. Printed in green.

	12	25	50	100 miles
Each	$2.00	$3.25	$5.25	$9.50

No. 829-30 Not continuous. Bound in Morocco Covers.

No. 829 Plate A. 4x20 to one inch. Size of book 7x10 inches. Printed in green.

	25	50	100 leaves
Each	$1.75	$2.25	$3.00

No. 830 Plate B. 4x30 to one inch. Size of book 5½x9½ inches. Printed in green.

	25	50	100 leaves
Each	$1.75	$2.25	$3.00

For prevailing prices see latest supplementary price list.

~~ALCO~~ PROFILE PAPERS AND CLOTHS

Continuous in Rolls

Our Profile Papers are printed on the best grade of paper. Will stand erasing well and they are superior in accuracy and clearness of lines.

Our Profile Tracing Cloth is printed on the Imperial Brand Cloth.

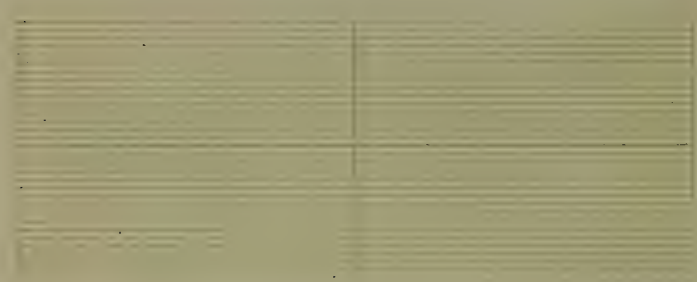


Plate A, 4x20 to One Inch.

		Per Roll.	Per Yd.
No. 840G	Green, 20 in. wide, Drawing Paper, 50-yd. rolls..	$10.00	$0.24
No. 840O	Orange, 20 in. wide, Drawing Paper, 50-yd. rolls..	10.00	.24
No. 840½G	Green, 10 in. wide, Drawing Paper, 50-yd. rolls..	6.25	.15
No. 840½O	Orange, 10 in. wide, Drawing Paper, 50-yd. rolls..	6.25	.15
No. 841G	Green, 20 in. wide, Mounted on Muslin, 20-yd. rolls	10.00	.60
No. 841O	Orange, 20 in. wide, Mounted on Muslin, 20-yd. rolls	10.00	.60
No. 841½G	Green, 10 in. wide, Mounted on Muslin, 20-yd. rolls	6.75	.40
No. 841½O	Orange, 10 in. wide, Mounted on Muslin, 20-yd. rolls	6.75	.40
No. 842O	Orange, 20 in. wide, Tracing Paper, 50-yd. rolls..	10.00	.24
No. 842½O	Orange, 10 in. wide, Tracing Paper, 50-yd. rolls..	6.25	.15
No. 843G	Green, 20 in. wide, Drawing Cloth, 20-yd. rolls..	10.00	.60
No. 843O	Orange, 20 in. wide, Drawing Cloth, 20-yd. rolls..	10.00	.60
No. 844G	Green, 20 in. wide, Tracing Cloth, 20-yd. rolls..	12.50	.75
No. 844O	Orange, 20 in. wide, Tracing Cloth, 20-yd. rolls..	12.50	.75

PROFILE-PLAN PAPERS AND CLOTHS

Plate A, 4x20 to One Inch.

Width of paper same as our 20-inch papers but ruling only 10 inches wide, leaving the other half blank for sketching and for explanatory notes. A very convenient paper as it saves referring to several maps for the desired information.

		Per Roll.	Per Yd.
No. 846G	Green, Drawing Paper, 50-yard rolls	$10.00	$0.24
No. 846O	Orange, Drawing Paper, 50-yard rolls	10.00	.24
No. 847O	Orange, Tracing Paper, 50-yard rolls	10.00	.24
No. 848G	Green Tracing Cloth, 20-yard rolls	12.50	.75
No. 848O	Orange, Tracing Cloth, 20-yard rolls	12.50	.75

Samples of any of our papers sent on application.

For prevailing prices see latest supplementary price list.

~~ALCO~~ PROFILE PAPERS AND CLOTHS

Continuous in Rolls

Plate B, 4x30 to One Inch

		Per Roll.	Per Yd.
No. 850G	Green, 20 in. wide, Drawing Paper, 50-yd. rolls..	$10.00	$0.24
No. 850O	Orange, 20 in. wide, Drawing Paper, 50-yd. rolls..	10.00	.24
No. 850½G	Green, 9 in. wide, Drawing Paper, 50-yd. rolls..	6.25	.15
No. 850½O	Orange, 9 in. wide, Drawing Paper, 50-yd. rolls..	6.25	.15
No. 851G	Green, 20 in. wide, Mounted on Muslin, 20-yd. rolls	10.00	.60
No. 851O	Orange, 20 in. wide, Mounted on Muslin, 20-yd. rolls	10.00	.60
No. 851½G	Green, 9 in. wide, Mounted on Muslin, 20-yd. rolls	6.75	.40
No. 851½O	Orange, 9 in. wide, Mounted on Muslin, 20-yd. rolls	6.75	.40
No. 852O	Orange, 20 in. wide, Tracing Paper, 50-yd. rolls..	10.00	.24
No. 852½O	Orange, 9 in. wide, Tracing Paper, 50-yd. rolls..	6.25	.15
No. 853G	Green, 20 in. wide, Drawing Cloth, 20-yd. rolls..	10.00	.60
No. 853O	Orange, 20 in. wide, Drawing Cloth, 20-yd. rolls..	10.00	.60
No. 854G	Green, 20 in. wide, Tracing Cloth, 20-yd. rolls..	12.50	.75
No. 854O	Orange, 20 in. wide, Tracing Cloth, 20-yd. rolls..	12.50	.75

PROFILE-PLAN PAPERS AND CLOTHS

Plate B, 4x30 to One Inch

20-inch stock but ruled only 9 inches, leaving other half blank for sketching, etc.

		Per Roll.	Per Yd.
No. 856G	Green, Drawing Paper, 50-yd. rolls	$10.00	$0.24
No. 856O	Orange, Drawing Paper, 50-yd. rolls	10.00	.24
No. 857O	Orange, Tracing Paper, 50-yd. rolls	10.00	.24
No. 858G	Green, Tracing Cloth, 20-yd. rolls	12.50	.75
No. 858O	Orange, Tracing Cloth, 20-yd. rolls	12.50	.75

Samples of any of our papers sent on application.

For prevailing prices see latest supplementary price list.

~~ALCO~~ CROSS SECTION PAPERS AND CLOTHS

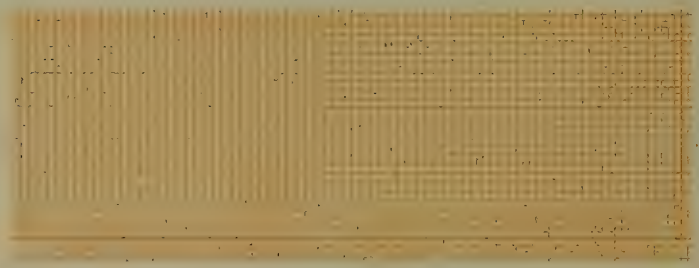
Continuous in Rolls

10x10 to One Inch

		Per Roll.	Per Yd.
No. 860G Green,	20 in. wide, Drawing Paper, 50-yd. rolls	$10.00	$0.24
No. 860O Orange,	20 in. wide, Drawing Paper, 50-yd. rolls	10.00	.24
No. 861G Green,	20 in. wide, Mounted on Muslin, 20-yd. rolls	10.00	.60
No. 861O Orange,	20 in. wide, Mounted on Muslin, 20-yd. rolls	10.00	.60
No. 862O Orange,	20 in. wide, Tracing Paper, 50-yd. rolls	10.00	.24
No. 863G Green,	20 in. wide, Drawing Cloth, 20-yd. rolls	10.00	.60
No. 863O Orange,	20 in. wide, Drawing Cloth, 20-yd. rolls	10.00	.60
No. 864G Green,	20 in. wide, Tracing Cloth, 20-yd. rolls	12.50	.75
No. 864O Orange,	20 in. wide, Tracing Cloth, 20-yd. rolls	12.50	.75

~~ALCO~~ MILLIMETER PAPERS AND CLOTHS

Continuous in Rolls



		Per Roll.	Per Yd.
No. 870G Green,	50 cm. wide, Drawing Paper, 50-yd. rolls	$10.00	$0.24
No. 870O Orange,	50 cm. wide, Drawing Paper, 50-yd. rolls	10.00	.24
No. 871G Green,	50 cm. wide, Mounted on Muslin, 20-yd. rolls	10.00	.60
No. 871O Orange,	50 cm. wide, Mounted on Muslin, 20-yd. rolls	10.00	.60
No. 872O Orange,	50 cm. wide, Tracing Paper, 50-yd. rolls	10.00	.24
No. 874G Green,	50 cm. wide, Tracing Cloth, 20-yd. rolls	12.50	.75
No. 874O Orange,	50 cm. wide, Tracing Cloth, 20-yd. rolls	12.50	.75

STATISTICAL CROSS SECTION PAPER

Ruled 10x12 to one inch. Each 10th horizontal line and each 24th vertical line heavy.

		Per Roll.	Per Yd.
No. 878O Orange,	10 in. wide, Tracing Paper only, 25-yd. rolls	$5.00	$0.24

For prevailing prices see latest supplementary price list.

~~ALCO~~ ENGRAVED CROSS SECTION PAPERS IN SHEETS

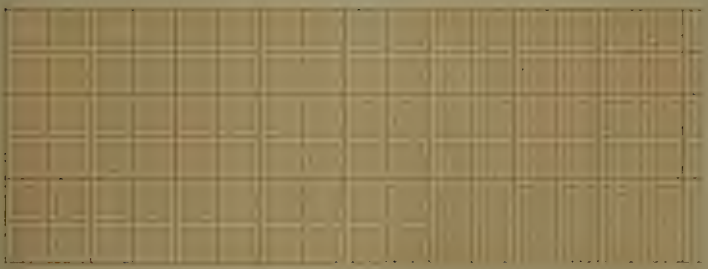
Size of engraving 16x20 inches.

Illustration of engraving 8x8 to one inch.

		Quire.	Sheet.
No. 880G	Green, engraving 8x8 to one inch, on Drawing Paper	$3.50	$0.20
No. 880O	Orange, engraving 8x8 to one inch, on Drawing Paper	3.50	.20
No. 881O	Orange, engraving 8x8 to one inch, on Tracing Paper	3.50	.20
No. 882G	Green, engraving 10x10 to one inch, on Drawing Paper	3.50	.20
No. 882O	Orange, engraving 10x10 to one inch, on Drawing Paper	3.50	.20
No. 883O	Orange, engraving 10x10 to one inch, on Tracing Paper	3.50	.20
No. 884G	Green, engraving 12x12 to one inch, on Drawing Paper	3.50	.20
No. 885G	Green, engraving 16x16 to one inch, on Drawing Paper	3.50	.20
No. 885O	Orange, engraving 16x16 to one inch, on Drawing Paper	3.50	.20
No. 886O	Orange, engraving 16x16 to one inch, on Tracing Paper	3.50	.20
No. 887G	Green, engraving 5x5 to half inch, on Drawing Paper	3.50	.20
No. 887O	Orange, engraving 5x5 to half inch, on Drawing Paper	3.50	.20
No. 888O	Orange, engraving 5x5 to half inch, on Tracing Paper	3.50	.20

For ruled Cross Section Papers in Sheets see page 228.

"ALCO" ENGRAVED GRAPHIC PAPERS IN SHEETS



10x10 to the half inch, fifth lines heavy.

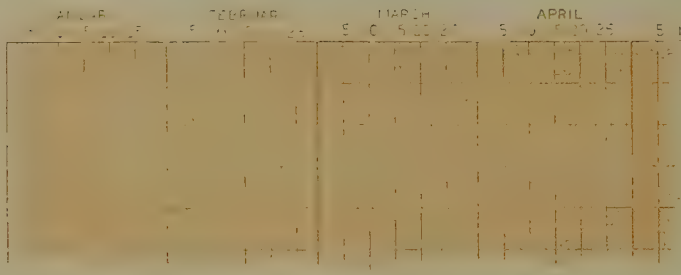
		Ream	Per 100 Sheets	Quire
No. 890A	Olive tint, engraving 5 x 7½, on Drawing Paper	$4.50	$0.90	$0.25
No. 891O	Orange, engraving 5 x 7½, on Tracing Paper	4.50	.90	.25
No. 892A	Olive tint, engraving 7½x10, on Drawing Paper	5.40	1.20	.30
No. 893O	Orange, engraving 7½x10, on Tracing Paper	5.40	1.20	.30
No. 894A	Olive tint, engraving 10 x15, on Drawing Paper	13.50	3.00	.75
No. 895O	Orange, engraving 10 x15, on Tracing Paper	13.50	3.00	.75

"ALCO" ENGRAVED MILLIMETER PAPERS IN SHEETS

Divided in millimeters, centimeter lines heavy.

		Ream	Per 100 Sheets	Quire
No. 900A	Olive tint, engraving 15x20 cm., on Drawing Paper	$5.40	$1.20	$0.30
No. 901O	Orange, engraving 15x20 cm., on Tracing Paper	5.40	1.20	.30
No. 902O	Orange, engraving 18x25 cm., on Drawing Paper	7.20	1.60	.40
No. 903O	Orange, engraving 18x25 cm., on Tracing Paper	7.20	1.60	.40

ENGRAVED RECORD SHEETS



		Per 100 Sheets	Quire	Sheet
No. 910	Engraving 7 x12 inches, on drawing paper, Green only..	$4.75	$1.35	$0.06
No. 911	Engraving 7 x12 inches, on tracing paper, Orange only..	4.75	1.35	.06
No. 912	Engraving 5½x 8¾ inches, on drawing paper, Green only..	4.75	1.35	.06
No. 914	Engraving 5½x 8¾ inches, on tracing paper, Orange only..	4.75	1.35	.06

WEBB'S CO-ORDINATE PAPER

Webb's Co-ordinate Paper is a convenient and accurate cross-section paper for drafting rooms, technical schools, laboratories, etc. It is printed from accurate engravings in a neutral olive tint, which can be photographed or photo-printed. The scale of the rulings is between the English and French (½ inches and centimeters) subdivided 10x10. The lines of Nos. 915 to 918 are numbered in two directions for ready reference to any point on the paper. Sheets are punched for portfolio binding. A table of natural tangents is on the margin of some of the larger-size sheets, for laying off angles.

			Ream	Quire	Sheet
No. 915	Best Linen Record Paper,	8¾x11⅜ inches, 180x220 squares...	$18.00	$0.95	$0.04
No. 916	Best Linen Record Paper,	11⅜x17¾ inches, 240x350 squares...	31.35	1.65	.07
No. 917	Best Thin Bond Paper,	8¾x11⅜ inches, 180x220 squares...	18.00	.95	.04
No. 918	Best Thin Bond Paper,	11⅜x17¾ inches, 240x350 squares...	31.35	1.65	.07
No. 919	Best Thin Bond Paper,	8 x10½ inches, 160x220 squares...	13.30	.70	.03
No. 920	Best Thin Bond Paper,	10½x16 inches, 220x330 squares...	26.60	1.40	.06
No. 921	Smooth Drawing Paper,	8 x10½ inches, 160x220 squares per block of 50 sheets...	.75		

SCHOOL CROSS-SECTION OR CO-ORDINATE PAPER

Metric

No. 923

		Ream.	Quire	Sheet
No. 923	School Cross Section Paper, metric, 18x24 cm., numbered every centimeter on two edges, printed in green only.....	$8.00	$0.40	$0.03

For prevailing prices see latest supplementary price list.

LOGARITHMIC PAPER

Logarithmic Paper is so ruled that the scales in each direction are logarithmic instead of uniform, as on other cross-section papers; the numbers and divisions marked are placed at such points as to make their distances from the origin proportional to the logarithm of such numbers instead of to the numbers themselves. By means of this paper logarithmic operations are performed graphically, without reference to the logarithms themselves. Many hydraulic and other engineering computations are facilitated by its use, and various relationships (sizes of tie-bars, shafts, etc., in terms of varying load, or the inverse; circumferences and diameters of circles in terms of their radii or diameters, or the inverse; weights of the series of bodies of the same substance and form, but of varying size, or the inverse, etc., etc.), can be represented.

	Quire	Sheet
No. 925 Engraving 10x10 inches, on Tracing Bond Paper, green only, 5-inch base	$1.50	$0.08
No. 926 Engraving 10x10 inches, on Tracing Bond Paper, green only, 10-inch base	1.50	.08

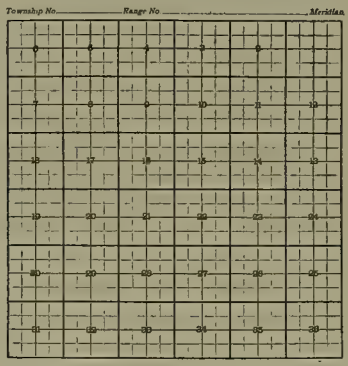
ISOMETRIC SKETCHING PAPER

For making drawings and sketches in Isometric Perspective.

	Quire	Sheet
No. 928A Engraving 6x9 in. on Drawing Paper, green only	$0.15	$0.01
No. 928B Engraving 9x12 in. on Drawing Paper, green only	.30	.02
No. 928C Engraving 12x18 in. on Drawing Paper, green only	.55	.04
In Pads of 40 Sheets		Per pad
No. 929A Engraving 6x9 inches, on Drawing Paper, green only		$0.30
No. 929B Engraving 9x12 inches, on Drawing Paper, green only		.60
No. 929C Engraving 12x18 inches, on Drawing Paper, green only		1.10

For prevailing prices see latest supplementary price list.

TOWNSHIP PAPERS



We offer the following large assortment of Township Papers, printed on the highest grade of ledger or tracing paper, in black or colors, as listed.

ON LEDGER PAPER

		Per pad.
No. 930	Section Plat, 3½x7½", Section 2¾x2¾". Printed black. In pads of 40 sheets	$0.25

		Per 100	Doz.	Each.
No. 931	Township Plat, 7x8½", ¾-inch Sections. Printed in black, blue and red	$2.70	$0.35	$0.03
No. 932	Township Plat, 7x8½", 1-inch Sections. In black only	2.70	.35	.03
No. 933	Township Plat, 8½x11", 1-inch Sections. In black, blue, red and violet	2.70	.35	.03
No. 934	Township Plat, 8½x11", 1 Township, ¾-inch Sections. Extra section all around township. In black, blue, red and violet	2.70	.35	.03
No. 935	Township Plat, 8½x11", 1 Township, 1-inch Sections. Extra section all around township. In black, blue, red and violet	2.70	.35	.03
No. 936	School District Plat, 8½x11", 4 Townships in body, ½-inch Sections. In black, red and violet	2.70	.35	.03
No. 937	Township Plat, 14x17", with margin for binding, 2-inch Sections. In black, blue, red and violet	7.50	1.00	.10
No. 938	Township Plat, 14x17", 20 Townships, ½-inch Sections. In black, blue and red	7.50	1.00	.10
No. 939	Township Plat, 16½x16½", 9 Townships, ¾-inch Sections. In black, red, violet and green	7.50	1.00	.10
No. 940	Township Plat, 16x21", 12 Townships, ¾-inch Sections. In black, red, violet and green	7.50	1.00	.10
No. 941	Township Plat, 18x21", 30 Chains to the inch. In black, blue, red and violet	7.50	1.00	.10
No. 942	Township Plat, 19x24", 3-inch Sections. In black, red, green and violet	7.50	1.00	.10

ON TRACING PAPER

		Per 100	Doz.	Each.
No. 943	Township Plat, 14x17", 2-inch Sections. In black only	$7.50	$1.00	$0.10

PLAT BOOKS

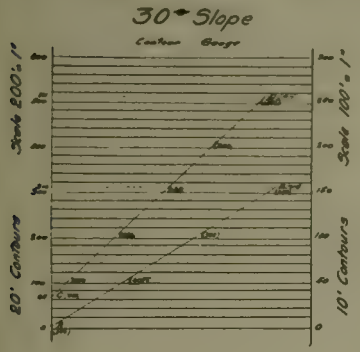
Our Plat Books contain 40 leaves, size 3¼x7 inches, bound in flexible sheep covers. Printed and ruled in black.

		Doz.	Each.
No. 945	Section Plat Book, containing 80 Sections	$3.50	$0.35
No. 945¼	Township Plat Book, containing 80 Townships	3.50	.35
No. 945½	Township and Section Plat Book, containing 20 Townships and 60 Sections	3.50	.35

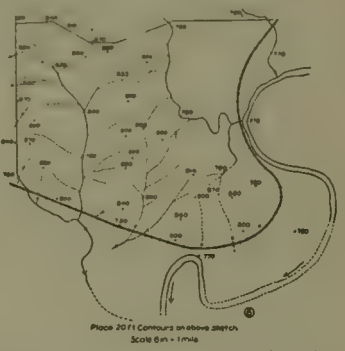
For prevailing prices see latest supplementary price list.

THE ABBEMA CONTOUR GAUGE

For rapidly determining in a simple manner contour intervals in map making.



No. 946



No. 948 (showing one example only)

No. 946 Abbema Contour Gauge, consisting of four printed tracing cloth sheets 7½x10 inches, for 15, 30 and 45 degree slopes, contour intervals of 10 and 20 feet for maps drawn to a scale of 100 and 200 feet to 1 inch. Complete with instructions. Per set $1.00

No. 947 Abbema Contour Gauge, consisting of three printed tracing cloth sheets 7½x10 inches, for 15, 30 and 45 degree slopes, contour intervals of 40 and 80 feet for maps drawn to scale of 3 and 6 inches to 1 mile. Complete with instructions. Per set 1.00

CONTOUR SHEETS

Example Sheets for familiarizing students in the principles of Contour Map Making.

	Per doz.	Each
No. 948 Contour Sheets, 17x28 inches, with nine examples in contour map drawing	$0.50	$0.05

SHEETS OF LETTERS AND CONVENTIONAL SIGNS

As adopted by the U. S. Geological Survey and the U. S. Coast and Geodetic Survey.

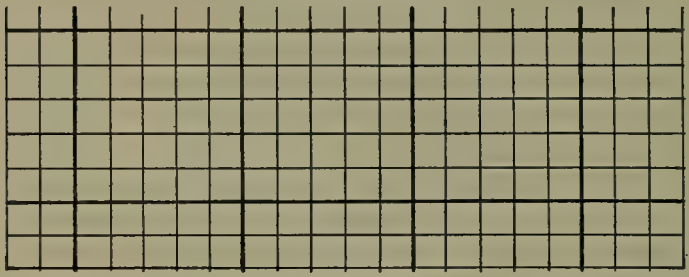
	Per doz.	Each
No. 949A Sheet of Conventional Signs, showing symbols and abbreviations, size 20x33 inches	$2.50	$0.25
No. 949B Sheets of Lettering and Conventional Signs, showing lettering and symbols used on the Topographic Maps of the U. S. G. S.....	1.00	.10
	Per doz. sets	Per set
No. 949C Set of 9 Sheets of Lettering, showing letters as used on the maps of the U. S. Coast and Geodetic Survey	$2.50	$0.25

For books on lettering see page 556.
See lettering triangles, page 448.

For prevailing prices see latest supplementary price list.

RULED CROSS SECTION PAPER IN SHEETS

On Drawing Paper



		Ream	Quire	Sheet
	Inch Lines Heavy.			
No. 950	Sheets 16x21 inches, ruled in blue, 5x5 to one inch	$17.50	$1.00	$0.05
No. 951	Sheets 16x21 inches, ruled in blue, 8x8 to one inch	17.50	1.00	.05
No. 952	Sheets 16x21 inches, ruled in blue, 10x10 to one inch	17.50	1.00	.05
No. 953	Sheets 16x21 inches, ruled in blue, 12x12 to one inch	17.50	1.00	.05

TOPOGRAPHIC PAPER

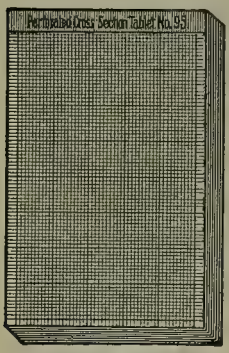
On Drawing Paper

		Ream	Quire	Sheet
No. 954	Sheets 16x21 inches, ruled red and blue, 400 feet to 1 inch	$17.50	$1.00	$0.05

RULED QUADRILLE PAPER IN SHEETS

On Drawing Paper

		Ream	Quire	Sheet
	All lines equally heavy, inch lines not heavier.			
No. 955	Sheets 16x21 inches, ruled in blue, 4x4 to one inch	$17.50	$1.00	$0.05
No. 956	Sheets 16x21 inches, ruled in blue, 6x6 to one inch	17.50	1.00	.05



No. 958

CROSS SECTION PADS

No. 958-959 Cross Section Pads are made of high grade white paper, with perforated top, and contain 80 leaves each. Inch lines heavy.

		Doz.	Each
No. 958	6x 9 inches, 10 squares to the inch	$3.50	$0.35
No. 959	8x10 inches, 10 squares to the inch	4.50	.45
No. 958½	6x 9 inches, 8 squares to the inch	3.50	.35
No. 959½	8x10 inches, 8 squares to the inch	4.50	.45

QUADRILLE PADS

No. 960-963 Quadrille Pads are similar to our No. 958-959 pads, but are ruled 4 squares to the inch, all lines equally heavy.

		Doz.	Each
No. 960	4x 6 inches	$2.00	$0.20
No. 961	5x 8 inches	3.00	.30
No. 962	6x 9 inches	3.50	.35
No. 963	8x10 inches	4.50	.45

No. 964-966 Quadrille Pads are made of high grade white paper, with gummed side and top, and contain 80 leaves each. All lines ruled equally heavy.

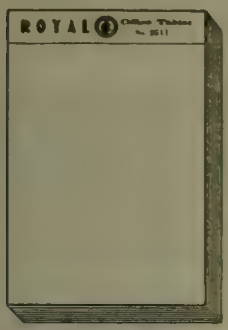
		Doz.	Each
No. 964	8½x11 inches, ruled 10 squares to the inch	$2.50	$0.25
No. 965	8½x11 inches, ruled 8 squares to the inch	2.50	.25
No. 966	8½x11 inches, ruled 6 squares to the inch	2.50	.25

No. 967-969 Quadrille Pads are made of good grade Chemical Manila paper, with gummed side and top, and contain 80 leaves each. All lines ruled equally heavy.

		Doz.	Each
No. 967	8½x11 inches, ruled 10 squares to the inch	$2.00	$0.20
No. 968	8½x11 inches, ruled 8 squares to the inch	2.00	.20
No. 969	8½x11 inches, ruled 6 squares to the inch	2.00	.20

For prevailing prices see latest supplementary price list.

FIGURING PADS



No. 970-974

No. 975-979

Nos. 970-974 Figuring Pads are made of good quality white paper, adapted for pen or pencil use. Tops of leaves perforated for removal. 72 leaves to pad.

		Doz.	Each
No. 970	4 x 6 inches	$0.40	$0.05
No. 971	4½x 7 inches	.50	.05
No. 972	5 x 8 inches	.60	.05
No. 973	6 x 9 inches	.75	.08
No. 974	7 x12 inches	1.00	.10

Nos. 975-978 Figuring Pads are made of high grade Canary writing paper adapted for pen or pencil use. Tops of leaves perforated for removal. 72 leaves to pad.

		Doz.	Each
No. 975	4 x 6 inches	$0.50	$0.05
No. 976	4½x 7 inches	.60	.05
No. 977	5 x 8 inches	.75	.08
No. 978	6 x 9 inches	1.00	.10
No. 979	8 x12 inches	1.35	.13

No. 980-981

COMMERCIAL TABLETS

Nos. 980-981 Commercial Tablets are made of good grade Manila writing paper ruled on both sides. 72 leaves to tablet.

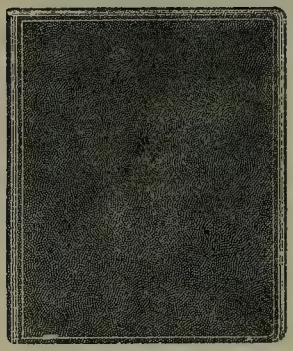
No.		Doz.	Each
980	8x12½ inches, with margin	$1.00	$0.10
981	8x12½ inches, without margin	1.00	.10

Nos. 982-983 Commercial Tablets are made of superior grade white paper, ruled on both sides. 72 leaves to tablet.

No.		Doz.	Each
982	8 x12½ inches, with margin	$1.00	$0.10
983	8½x14 inches, Quadrille ruled 4 squares to the inch, all lines equally heavy	1.50	.15

For prevailing prices see latest supplementary price list.

FIGURING OR TRAVERSE BOOKS



No. 985-986

No. 987-988

No. 985-986 Figuring Books contain 150 pages of fine grade canary writing paper, size 10¼x12⅜ inches, not paged, half bound, Russia red leather back and corners, marble paper sides.

		Dozen	Each
No. 985	Faint horizontal ruling only	$12.00	$1.00
No. 986	Faint Quadrille ruling	12.00	1.00

Nos. 987-988 Figuring Books contain 100 pages of good quality white writing paper, size 7½x9½ inches. Faint horizontal ruling.

		Dozen	Each
No. 987	Stiff duck binding	$3.00	$0.25
No. 988	Semi-flexible morocco covers	3.00	.25

For prevailing prices see latest supplementary price list.

DATE BOOKS OR DIARIES

To record the daily progress of an undertaking.

Send for special catalog of diaries or daily journals.

TIME BOOKS

With printed heading and table of wages

No. 992-993 Time Books contain 24 leaves, 4⅛x6¾ inches. Pressboard lined, imitation sheep flexible covers.

	Dozen	Each
No. 992 Weekly Time Books	$1.00	$0.10
No. 993 Monthly Time Books	1.00	.10

Nos. 994-995 Time Books contain 56 leaves, 4⅛x6¾ inches. Full sheep stiff covers.

	Dozen	Each
No. 994 Weekly Time Books	$2.50	$0.25
No. 995 Monthly Time Books	2.50	.25

No. 996 Time Books are similar to No. 994, but with flap pocket.

	Dozen	Each
No. 996 Weekly Time Books	$2.50	$0.25

STYLOGRAPH BOOKS

For Rapid Letter Copying

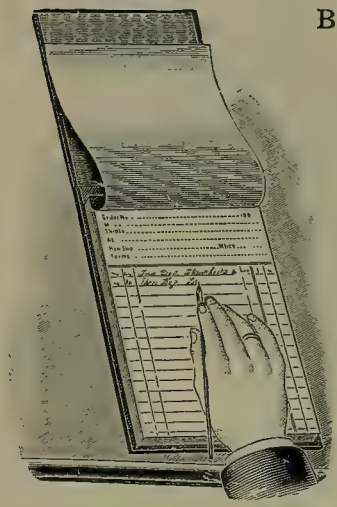
No. 997.

Made up of alternate sheets of ruled copying and letter paper. Each book supplied with stylus and necessary writing materials ready for use. After writing, the copy sheet is detached, the letter remaining in the book.

	Each
No. 997A McDonald Stylograph Book No. 4, size 8½x11 inches, 200 leaves	$1.30
No. 997B McDonald Stylograph Book No. 5, size 8½x11 inches, 300 leaves	2.00
No. 997C McDonald Stylograph Book No. 6, size 8½x11 inches, 500 leaves	2.80

For prevailing prices see latest supplementary price list.

DUPLICATING AND TRIPLICATING ORDER BOOKS



Half bound, American Russia back, black cloth sides, with index in front. End opening. Good grade paper.

No.		Size	Leaves	Doz.	Each
5004	Duplicating..	7¼x4⅜	150	$6.00	$0.60
5004½	Filler for 5004	7¼x4⅛	150	3.00	.30
5005	Triplicating ..	7¼x4⅜	150	6.00	.60
5005½	Filler for 5005	7¼x4⅛	150	3.00	.30
5020	Duplicating...	8½x5⅝	150	8.00	.80
5020½	Filler for 5020	8⅜x5⅜	150	4.25	.40
5021	Triplicating...	8½x5⅝	150	8.00	.80
5021½	Filler for 5021	8⅜x5⅜	150	4.25	.40
5036	Duplicating...	10⅝x8½	150	13.50	1.35
5036½	Filler for 5036	10½x8¼	150	7.50	.75
5037	Triplicating...	10⅝x8½	150	13.50	1.35
5037½	Filler for 5037	10½x8¼	150	7.50	.75

I-P LOOSE LEAF BOOKS

Bound in Black Seal Grain, lined with Moire Silk Grained Skiver. Capacity, ¼-inch rings, 50 sheets and index.

END OPENING

No.	Size of Leaf	Size of Ring	Complete with Sheets and Leather Index, Each	Covers Only, Each	Leather Tab Indexes, Each	Sheets per Pkg.* of 100
1101	2 x4 -in.	¼"	$0.95	$0.55	$0.30	$0.20
1102	2½x4½-in.	¼"	1.05	.65	.30	.20
1103	3 x5 "	¼"	1.25	.75	.35	.25
1104	3½x6 "	¼"	1.40	.85	.40	.30

SIDE OPENING

102	4½x2½-in.	¼"	$1.05	$0.65	$0.30	$0.20
103	5 x3 "	¼"	1.25	.75	.35	.25
104	6 x3½ "	¼"	1.40	.85	.40	.30
105	6¾x3¾ "	¼"	1.65	1.10	.40	.30

Bound Full Red Cross-Grain Cowhide, lined with Imitation Skiver.
Capacity, ½-inch rings, 125 sheets and index.
" 1 " " 250 " " "

SIDE OPENING

No.	Size of Leaf	Size of Ring	Complete with Sheets and Linen Index, Each	Covers Only, Each	Linen Tab Indexes, Each	Sheets per Pkg.* of 125
1501	5½x3 -in.	½"	$1.35	$0.90	$0.20	$0.25
1503	6¾x3¾ "	½"	1.50	1.00	.20	.30
1505	7¼x4¼ "	½"	1.75	1.10	.25	.40
1512	9½x6 "	1 "	3.50	1.95	.35	.60

Bound Full Levant Grain Black Cowhide, Tan Leather Lined, Pocket in Front Cover.
Capacity, ½-inch rings, 125 sheets and index.
" 1 " " 250 " " "

SIDE OPENING

No.	Size of Leaf	Size of Ring	Complete with Sheets and Leather Index, Each	Covers Only, Each	Leather Tab Indexes, Each	Sheets per Pkg.* of 125
501	5½x3 -in.	½"	$2.00	$1.25	$0.50	$0.25
503	6¾x3¾ "	½"	2.20	1.40	.50	.30
505	7¼x4¼ "	½"	2.50	1.50	.60	.40
506	7¼x4¼ "	1 "	3.20	1.80	.60	.40

*We carry three different styles of sheets: Unruled, Faint Horizontal Ruling, and Quadrille Ruling. When ordering please state style of ruling desired.
Complete list of I-P Loose Leaf Books mailed on request.

For prevailing prices see latest supplementary price list.

DRAWING PAPERS

We deem it unnecessary to make much comment on an article so universally used. The draftsman has learned of its qualities from his earliest experiences, so we only desire to assure our friends that the papers we carry represent the standards of excellence for the respective purposes for which they are intended.

DRAWING PAPERS IN SHEETS

WHATMAN
Genuine Hand-Made
DRAWING PAPERS

Whatman's Drawing Papers, "Selected Best" and "Retree," are made as one quality and the sheets are afterwards examined and separated at the mill. The "Selected Best" are sheets without imperfections. Made in three different surfaces. When ordering please state size and surface desired.

No. 1000 **WHATMAN'S** Hand-Made Drawing Paper, with H. P. (smooth surface), C. P. (finely grained surface) or R. (rough surface).*

		Selected Best			Retree		
		Ream	Quire	Sheet	Ream	Quire	Sheet
Cap	13x17 inches	$11.50	$0.65	$0.05	$9.50	$0.55	$0.04
Demy	15x20 inches	17.80	1.00	.06	16.00	.90	.05
Medium	17x22 inches	25.80	1.45	.09	23.00	1.30	.08
*Royal	19x24 inches	33.25	1.90	.11	28.75	1.65	.10
Super Royal	19x27 inches	40.15	2.25	.14	34.40	1.95	.12
*Imperial	22x30 inches	55.80	3.15	.16	49.30	2.75	.14
Atlas	26x34 inches	86.50	4.90	.24	66.25	3.75	.20
*Double Elephant	27x40 inches	110.00	6.25	.29	98.75	5.55	.25
Antiquarian	31x53 inches	476.00	27.00	1.35	405.00	23.00	1.15

*These sizes ONLY are carried in R. (rough surface).

No. 1001 **WHATMAN'S** Extra Heavy Hand-Made Drawing Paper, with H. P., C. P. or R. surface. Selected Best only.

		Ream	Quire	Sheet
Imperial	22x30 inches (140-lb. stock)	$127.00	$7.15	$0.40
Double Elephant	27x40 inches (260-lb. stock)	235.00	13.30	.65

Mounted Whatman Hand-Made Drawing Papers, see page 246.
Complete sample book of Whatman's Papers sent on application.

For prevailing prices see latest supplementary price list.

WHITE DRAWING PAPERS IN SHEETS

No. 1005 **"ORLAND"** Drawing Paper. A pure white drawing paper of highest quality. Very tough, with smooth hard surface. Will stand erasing perfectly. An excellent paper for ink line drawings. All sizes are of the same thickness.

	Inches	Ream	Quire	Sheet
Royal	19x24	$28.75	$1.65	$0.09
Imperial	22x30	41.00	2.35	.12
Double Elephant	27x40	62.75	3.60	.18

No. 1006 **"SEQUOIA"** Drawing Paper. A pure white drawing paper of very high quality. Medium surface. Adapted for pencil, ink or color work, and will stand erasing perfectly. An excellent paper for school or college work. The various sizes differ in thickness, the Double Elephant being the heaviest and the Cap the lightest.

	Inches	Ream	Quire	Sheet
Cap	13½x17	$ 5.75	$0.35	$0.02
Demy	15 x20	8.70	.50	.03
Medium	17 x22	11.50	.70	.04
Royal	19 x24	14.60	.85	.05
Super Royal	19 x27	17.40	1.00	.05
Imperial	22 x30	22.60	1.30	.07
Double Elephant	27 x40	43.50	2.50	.13

No. 1007 **"PACIFIC"** Drawing Paper. A white drawing paper of good quality. Slightly grained surface, adapted for pencil, ink, crayon or color work. Very suitable for use in schools, etc. The various sizes differ in thickness, the Double Elephant being the heaviest and the Cap the lightest.

	Inches	Ream	Quire	Sheet
Cap	13½x17	$ 3.85	$0.20	$0.01
Demy	15 x20	6.00	.35	.02
Medium	17 x22	8.15	.45	.03
Royal	19 x24	10.65	.55	.03
Super Royal	19 x27	12.00	.65	.04
Imperial	22 x30	14.90	.95	.05
Double Elephant	27 x40	28.80	1.80	.09

Samples of any of our papers sent on application.

For prevailing prices see latest supplementary price list.

CREAM DRAWING AND DETAIL PAPERS IN SHEETS

No. 1008 **"MODOC"** Drawing Paper. A cream color drawing paper of superior quality. It is tough, hard, uniform in grain and finish, stands erasing perfectly, and is an excellent paper for pencil, ink or color work. Will stand handling without soiling. All sizes are of the same thickness.

	Inches	Ream	Quire	Sheet
Royal	19x24	$18.70	$1.10	$0.06
Imperial	22x30	27.20	1.60	.08
Special	24x36	35.70	2.10	.11
Double Elephant	27x40	44.20	2.60	.13

"Modoc" Drawing Paper in rolls, see Catalog No. 1080.

No. 1009 **"MOHAVE"** Drawing Paper. A cream color drawing paper of very good quality. It is strong, uniform in grain and finish, stands erasing, and takes ink and color well. An excellent paper for schools and general drawing. All sizes are of the same thickness.

	Inches	Ream	Quire	Sheet
Royal	19x24	$12.75	$0.75	$0.04
Imperial	22x30	21.25	1.25	.07
Double Elephant	27x40	34.00	2.00	.10

"Mohave" Drawing Paper in rolls, see Catalog No. 1081.

No. 1010 **"ELSINORE"** Detail Paper. A tough paper of grained surface, a trifle darker in shade than the cream papers, possessing good erasing qualities. Suitable for either ink or pencil. All sizes are of the same thickness.

	Inches	Ream	Quire	Sheet
Royal	19x24	$ 8.75	$0.55	$0.03
Imperial	22x30	14.00	.85	.05
Double Elephant	27x40	21.60	1.30	.07

"Elsinore" Detail Paper in rolls, see Catalog No. 1086B.

Samples of any of our papers sent on application.

For prevailing prices see latest supplementary price list.

WATER COLOR BOARDS

No. 1015 **Whatman's Water Color Board.** Whatman Paper mounted on heavy board for water color work, with H. P. (smooth surface), C. P. (finely grained surface) or R. (rough surface). When ordering, please state surface desired.

	Per dozen	Each
22x30 inches	$4.80	$0.40

No. 1016 **Strathmore Illustrating Board.** A superior quality water color paper, with medium surface, mounted on heavy board.

	Per dozen	Each
22x28 inches	$3.60	$0.30
30x40 inches	6.00	.50

MOUNTING, POSTER AND MAT BOARDS

No. 1017 **White Mounting Board.** Especially adapted for mounting of architectural sketches.

	Size 22x28 in.		Size 30x40 in.	
	Per doz.	Each	Per doz.	Each
8 Sheet*	$1.20	$0.12		
16 Sheet			$5.00	$0.50

No. 1018 **Cream and White Mounting Board.** Cream on one side and white on the other. For mounting and matting.

	Size 30x40 in.		Size 44½x54 in.	
	Per 100	Each	Per 100	Each
"Thick"	$20.00	$0.20	$50.00	$0.50
"Double Thick"	30.00	.30	75.00	.75
"Treble Thick"	40	.40	100.00	1.00

No. 1019 **Alco Colored Mat Board.** Smooth dull surface, of same thickness as No. 1018 "Thick." In the following tints: White, Cream, Sepia, Buff, Grey, Nut Brown or Steel Grey.

When ordering, please state color desired.

	Per 100	Each
30x40 inches, "Thick"	$25.00	$0.25

No. 1020 **Alco Colored Mounting Board.** Smooth dull surface, in various thicknesses and colors.

	Per 100	Each
8 Sheet*, Carbon black and Scotch Grey	$10.00	$0.12
10 Sheet, Carbon black, Scotch Grey, Ash Grey, Steel Grey, Sage, Vandyke Brown and Ivy Green	12.50	.14
12 Sheet, Carbon black and Scotch Grey	13.50	.16
16 Sheet, Carbon black and Scotch Grey	17.00	.20

*NOTE—The term "Sheet" as used above designates the thickness of the various Illustration or Mounting boards, being the number of sheets pasted together in order to obtain the stated thickness. Also sometimes referred to as "Ply."

For prevailing prices see latest supplementary price list.

ARTISTS' PAPERS AND BOARDS

STRATHMORE DRAWING BOARDS

A superior quality Bristol Board, made in two finishes, S. (smooth or high surface) for Pen and Ink Drawing, and M. (medium, or dull surface) for Pencil, Pen and Water Color work, in 2, 3, 4, and 5 sheet thicknesses.

When ordering please state size, surface and thickness desired.

No. 1025 **Strathmore Drawing Boards,** with S. (Smooth or high surface) or M. (Medium or dull surface).

Size—	14½x23 in.		23x29 in.	
	Per 100	Each	Per 100	Each
2 Sheet*	$6.00	$0.08	$12.00	$0.15
3 Sheet	9.00	.12	18.00	.22
4 Sheet	12.00	.15	24.00	.30
5 Sheet	15.00	.18	30.00	.35

2- and 3-sheet Strathmore Drawing Boards are put up in packages of 50 sheets; 4- and 5-sheet, in packages of 25 sheets. Special prices for quantities.

CHARCOAL PAPERS

No. 1027 **Michallet Charcoal Paper.** In the following tints: White, light grey, buff, pink or blue.

When ordering, please state color desired.

	Per Ream	Quire	Sheet
Royal, 19x24 inches	$16.20	$0.90	$0.05

No. 1028 **Strathmore Charcoal Paper.** White only.

	Per Ream	Quire	Sheet
Royal, 19x24 inches	$10.80	$0.60	$0.03

TRANSFER PAPERS

No. 1030 **Transfer Paper,** for ink duplications. In the following tints: Blue, black, purple, red or white.

When ordering, please state color desired.

	Per Dozen	Sheet
11x18 inches	$0.30	$0.03
18x22 inches	.60	.06

No. 1031 **Graphite Transfer Paper,** for pencil duplications. Black only.

	Per Dozen	Sheet
11x18 inches	$0.35	$0.03
18x22 inches	.70	.07

FRISKETT TRACING PAPER

No. 1034 **Friskett Tracing Paper.** Adapted to the use of Commercial Artists.

	Per Dozen	Sheet
17½x23 inches	$1.00	$0.10

BLOTTING PAPER

No. 1036 **Blotting Paper.** In the following tints: White, buff, blue, pink or blue granite.

	Per Dozen	Sheet
19x24 inches	$1.00	$0.10

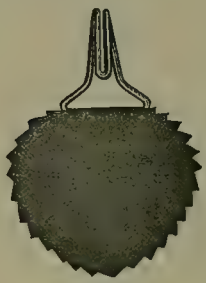
*See Note, page 236.

For prevailing prices see latest supplementary price list.

PASSEPARTOUT BINDING PAPER AND HANGERS

No. 1040

No. 1041



No. 1042

	Per gross	Per doz.	Each
No. 1038 Passepartout Binding, suitable for framing and preserving pictures, etc. Fine pebbled paper, heavily gummed. In rolls of 12 yards, ⅞ inch wide. In the following colors: Black, white, grey, brown, red, blue and crimson	$10.50	$1.00	$0.10
No. 1038½ Passepartout Binding, same as No. 1038 but gold or silver	22.50	2.00	.20
No. 1040 Passepartout Rings, in quarter gross boxes, per box			$0.60
No. 1041 Passepartout Suspension Rings, per box of 100			.25
No. 1042 Passepartout Suspension Hooks, per box of 100			.25

ADHESIVE PAPER AND CLOTH TAPE

For the binding of drawings to prevent tearing.

No. 1045

No. 1046-47

	Per doz.	Per spool
No. 1045 Adhesive Transparent Paper Tape, in rolls of 12 yards, ⅝ inch wide	$0.80	$0.10
No. 1046 White, Gummed Cloth Tape, in rolls of 10 yards, ¾ inch wide	1.50	.15
No. 1047, same as No. 1046 but 1¼ inches wide	2.50	.25
No. 1048 Transparent, Gummed Cloth Tape, in rolls of 10 yards, ¾ inch wide	3.50	.35

For prevailing prices see latest supplementary price list.

BRISTOL BOARDS

No. 1050 **"ALCO" Superfine Imported Bristol Board.** Finest selected clear stock. An excellent board for Photo Reproduction, black and white work, or Pen Drawings.

	Per Dozen	Each
6 Sheet*, size 22x28 inches	$2.40	$0.25

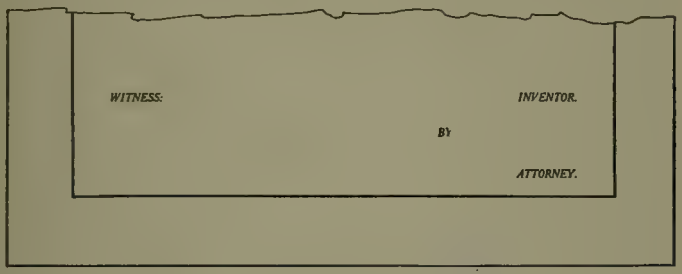
No. 1052 **Domestic Bristol Board.**

	Per Dozen	Each
3 Sheet*, size 22x28 inches	$1.80	$0.15

No. 1054 **Reynolds' Bristol Boards.**

Size—	2 Sheets*			3 Sheets*			4 Sheets*		
	Gross	Dozen	Sheet	Gross	Dozen	Sheet	Gross	Dozen	Sheet
12 x15 inches..	$ 6.90	$0.60	$0.06	$10.30	$0.90	$0.08	$13.75	$1.20	$0.10
14 x18 inches..	10.45	.90	.08	15.60	1.30	.12	20.85	1.75	.16
16½x21 inches..	14.20	1.20	.12	21.20	1.80	.16	28.35	2.40	.22
18 x22 inches..	18.15	1.60	.15	27.15	2.30	.22	36.25	3.10	.30
20½x28 inches..	....	...	..	52.30	4.40	.45	69.60	5.80	.60

PATENT OFFICE BRISTOL BOARDS



Patent Office Bristol Board, Printed
(With border, etc.)

	Gross	Dozen
No. 1055A **Reynolds'** 2-sheet, 10x15 inches, U. S. Standard..	$6.50	$0.60
No. 1055B **Reynolds'** 3-sheet, 10x15 inches, U. S. Standard..	7.50	.75
No. 1056 A **Windsor & Newton** 2-sheet, 10x15 inches, U. S. Standard	6.50	.60
No. 1056 B **Windsor & Newton** 3-sheet, 10x15 inches, U. S. Standard	7.50	.75

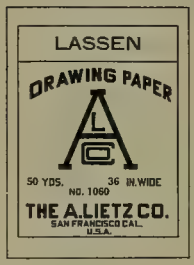
Patent Office Bristol Board, Plain
(Not printed)

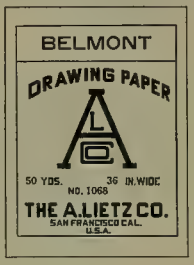
	Gross	Dozen
No. 1057A **Reynolds'** 2-sheet, 10x15 inches, U. S. Standard..	$ 5.00	$0.50
No. 1057B **Reynolds'** 3-sheet, 10x15 inches, U. S. Standard..	6.00	.60
No. 1058A **Reynolds'** 2-sheet, 15x20 inches, English Standard	10.00	1.00
No. 1058B **Reynolds'** 3-sheet, 15x20 inches, English Standard	12.00	1.20

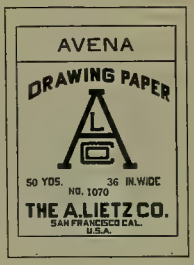
*NOTE—The term "Sheet," as used above, designates the thickness of the various Drawing or Bristol Boards, being the number of sheets pasted together in order to obtain the stated thickness. Also sometimes referred to as "Ply."

For prevailing prices see latest supplementary price list.

WHITE DRAWING PAPERS IN ROLLS







No. 1060 **"LASSEN" Drawing Paper, Medium.** A pure white drawing paper of highest quality. Very tough with a hard, slightly **grained** surface, will stand erasing perfectly. An excellent paper for all kinds of finished drawings, for pen, ink and water color, for outdoor work or for use in shops, where drawings are subject to much handling.

	Per roll of 25 yds.	10 yds.	Per yd.
36 inches wide	$5.00	$2.15	$0.25
42 inches wide	6.30	2.65	.30
62 inches wide	9.50	4.00	.45
In Original Rolls of about 40 pounds, any width; per pound			.45

No. 1061 **"LASSEN" Drawing Paper, Heavy.** Same as No. 1060 but heavier.

	Per roll of 25 yds.	10 yds.	Per yd.
62 inches wide	$11.40	$4.80	$0.55
72 inches wide	13.30	5.60	.65
In Original Rolls of about 40 pounds, any width; per pound			.45

No. 1064 **"RAMONA" Drawing Paper, Medium.** A high-grade white drawing paper with **Eggshell** surface. For all kinds of finished drawings, for pen, ink, water color or airbrush work.

	Per roll of 25 yds.	10 yds.	Per yd.
36 inches wide	$ 7.15	$3.00	$0.33
42 inches wide	8.30	3.50	.38
58 inches wide	10.70	4.50	.50
In Original Rolls of about 40 pounds, any width; per pound			.50

No. 1065 **"RAMONA" Drawing Paper, Heavy.** Same as No. 1064 but heavier.

	Per roll of 25 yds.	10 yds.	Per yd.
58 inches wide	$17.10	$7.20	$0.80
In Original Rolls of about 40 pounds; per pound			.50

Samples of any of our papers will be mailed upon application.

For prevailing prices see latest supplementary price list.

WHITE DRAWING PAPERS IN ROLLS

No. 1068 **"BELMONT" Drawing Paper, Medium.** A pure white drawing paper of superior quality. Very tough and strong, **smooth** surface. Can be folded without breaking. Especially adapted for mapping and general working drawings subject to rough handling.

	Per roll of 25 yds.	10 yds.	Per yd.
36 inches wide	$ 7.15	$3.00	$0.33
58 inches wide	10.70	4.50	.50
In Original Rolls of about 40 pounds, any width; per pound			.50

No. 1069 **"BELMONT" Drawing Paper, Heavy.** Same as No. 1068 but heavier.

	Per roll of 25 yds.	10 yds.	Per yd.
58 inches wide	$13.65	$5.75	$0.65
In Original Rolls of about 40 pounds; per pound			.50

No. 1070 **"AVENA" Drawing Paper.** A pure white drawing paper with excellent erasing qualities. The surface is slightly grained, making it desirable for ink, pencil or water color work.

	Per roll of 50 yds.	10 yds.	Per yd.
30 inches wide	$ 6.15	$1.30	$0.15
36 inches wide	8.00	1.70	.20
42 inches wide	9.50	2.00	.24
56 inches wide	14.25	3.00	.35
62 inches wide	16.15	3.40	.40
In Original Rolls of about 40 pounds, any width; per pound			.36

No. 1071 **"VENTURA" Drawing Paper.** A moderate priced white drawing paper with good erasing qualities. Slightly grained surface, suitable for pencil and ink work.

	Per roll of 50 yds.	10 yds.	Per yd.
36 inches wide	$7.35	$1.55	$0.18
42 inches wide	8.00	1.70	.20
In Original Rolls of about 40 pounds, any width; per pound			.25

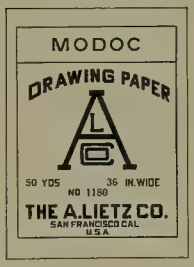
No. 1073 **"TEHAMA" Drawing Paper.** A white bond paper, unglazed, for pencil or ink drawing. Very strong.

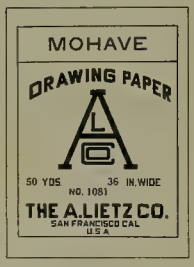
	Per roll of 50 yds.	10 yds.	Per yd.
42 inches wide	$5.00	$1.20	$0.15

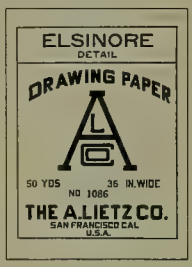
Samples of any of our papers will be mailed upon application.

For prevailing prices see latest supplementary price list.

DRAWING AND DETAIL PAPERS IN ROLLS







CREAM DRAWING PAPER

No. 1080 **"MODOC" Drawing Paper.** The highest grade cream color Drawing and Detail Paper. The surface is hard, slightly grained, and takes pencil, ink or water color. The erasing qualities are excellent. The Cream or Buff color is pleasing to the eye and permits much handling without soiling.

No. 1008 is the same paper in sheets.

	Per roll of 50 yds.	10 yds.	Per yd.
30 inches wide	$ 5.45	$1.15	$0.13
36 inches wide	6.40	1.35	.15
42 inches wide	8.00	1.70	.20
56 inches wide	10.20	2.15	.25
62 inches wide	11.85	2.50	.30
In Original Rolls of about 40 pounds, any width; per pound			.29

No. 1081 **"MOHAVE" Drawing Paper.** A cream color Drawing and Detail Paper with good erasing qualities. It is strong, of uniform grain and finish, and is an excellent paper for schools and all general drawing. Will take ink and water color.

No. 1009 is the same paper in sheets.

	Per roll of 50 yds.	10 yds.	Per yd.
36 inches wide	$5.25	$1.10	$0.13
42 inches wide	6.90	1.45	.17
In Original Rolls of about 40 pounds, any width; per pound			.25

GRAY DRAWING PAPER

No. 1083 **"PORTOLA" Drawing Paper.** A light gray Drawing Paper, highest quality, of similar texture and surface as our No. 1060 Lassen Drawing Paper. The color is pleasing and lends a nice effect to drawings and sketches.

	Per roll of 25 yds.	10 yds.	Per yd.
36 inches wide	$4.00	$1.70	$0.20
62 inches wide	8.00	3.40	.40
In Original Rolls of about 40 pounds, any width; per pound			.36

Samples of any of our papers will be mailed upon application.

For prevailing prices see latest supplementary price list.

DRAWING AND DETAIL PAPERS IN ROLLS

GREEN DRAWING PAPER

No. 1084 **"ENCINAL" Drawing Paper.** A light green Drawing Paper similar in texture and surface to our No. 1080 Modoc Drawing Paper. Its color is resting to the eye and permits much handling without soiling.

	Per roll of 50 yds.	10 yds.	Per yd.
36 inches wide	$6.40	$1.35	$0.15
42 inches wide	8.00	1.70	.20
In Original Rolls of about 40 pounds, per pound			.29

BUFF COLOR DETAIL PAPERS

No. 1086 A **"ELSINORE" Detail Paper, Thin.** A buff color Detail Paper, of a darker shade than our cream drawing papers, made of selected rag stock. It has a slightly grained surface, will take ink or pencil and erases well. Will stand rough handling and lies perfectly flat on drawing board.

	Per roll of 100 yds.	50 yds.	10 yds.	Per yd.
36 inches wide	$3.25	$1.80	$0.50	$0.07
42 inches wide	3.75	2.10	.60	.08
In Original Rolls of about 100 to 150 pounds, per pound				.12

No. 1086 B **"ELSINORE" Detail Paper, Medium.** Same as No. 1086 A but of Medium Heavy Weight.

No. 1010 is the same paper in sheets.

	Per roll of 100 yds.	50 yds.	10 yds.	Per yd.
36 inches wide	$4.00	$2.25	$0.70	$0.09
42 inches wide	4.70	2.60	.80	.10
48 inches wide	5.35	2.95	.90	.11
54 inches wide	6.00	3.25	1.00	.12
In Original Rolls of about 100 to 150 pounds, per pound				.12

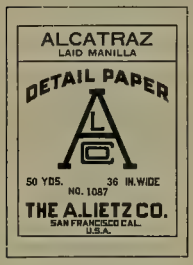
No. 1086 C **"ELSINORE" Detail Paper, Heavy.** Same as No. 1086 A but Extra Heavy.

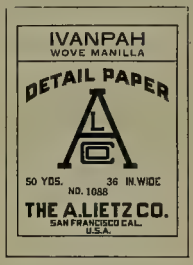
	Per roll of 100 yds.	50 yds.	10 yds.	Per yd.
36 inches wide	$5.00	$2.75	$0.85	$0.10
42 inches wide	5.75	3.10	1.00	.12
48 inches wide	6.75	3.65	1.10	.13
54 inches wide	7.50	4.00	1.25	.15
In Original Rolls of about 100 to 150 pounds, per pound				.12

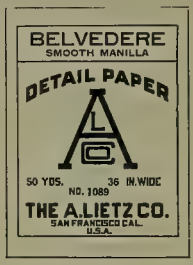
Samples of any of our papers will be mailed upon application.

For prevailing prices see latest supplementary price list.

MANILLA DETAIL PAPERS IN ROLLS







No. 1087A **"ALCATRAZ"** Laid Manilla Detail Paper, thin, slightly ribbed surface. Suitable for drafting purposes and will stand reasonable amount of erasing.

	Per roll of 100 yds.	50 yds.	10 yds.	Per yd.
36 inches wide	$2.70	$1.50	$0.35	$0.05
42 inches wide	3.40	1.90	.45	.06
48 inches wide	4.20	2.35	.55	.07
In original rolls of about 60 pounds, any width, per pound				.08

No. 1087B **"ALCATRAZ"** Laid Manilla Detail Paper, medium. Same as No. 1087A but heavier.

	Per roll of 100 yds.	50 yds.	10 yds.	Per yd.
36 inches wide	$3.40	$1.90	$0.45	$0.06
42 inches wide	4.20	2.35	.55	.07
48 inches wide	5.00	2.75	.65	.08
In original rolls of about 60 pounds, any width, per pound				.08

No. 1088A **"IVANPAH"** Wove Manilla Detail Paper, thin, slightly grained surface. Can be used for drafting and will stand reasonable amount of erasing.

	Per roll of 100 yds.	50 yds.	10 yds.	Per yd.
36 inches wide	$2.70	$1.50	$0.35	$0.05
42 inches wide	3.40	1.90	.45	.06
48 inches wide	4.20	2.35	.55	.07
In original rolls of about 60 pounds, any width, per pound				.08

No. 1088B **"IVANPAH"** Wove Manilla Detail Paper, medium. Same as No. 1088A but heavier.

	Per roll of 100 yds.	50 yds.	10 yds.	Per yd.
36 inches wide	$3.40	$1.90	$0.45	$0.06
42 inches wide	4.20	2.35	.55	.07
48 inches wide	5.00	2.75	.65	.08
In original rolls of about 60 pounds, any width, per pound				.08

No. 1089 **"BELVEDERE"** Smooth Manilla Detail Paper, smooth surface. Used for stencils, etc., also for covering drawing boards in drafting rooms.

	Per roll of 50 yds.	10 yds.	Per yd.
36 inches wide	$3.20	$0.75	$0.10
40 inches wide	3.65	.85	.12
48 inches wide	4.25	1.00	.14
54 inches wide	4.90	1.15	.16
In original rolls of about 100 pounds, any width, per pound			.10

PAPER CLOTH

No. 1095 **"ALCO"** Paper Cloth, a thin white, strong and practically indestructible cloth, made expressly for drafting purposes. Takes ink and pencil well and erases perfectly. Admits of blue printing or negative making.

	Per roll of 50 yds.	10 yds.	Per yd.
36 inches wide	$16.65	$3.50	$0.40
42 inches wide	21.35	4.60	.45

Samples of any of our papers or cloths will be mailed upon application.

For prevailing prices see latest supplementary price list.

KNIVES FOR CUTTING PAPER AND CLOTH

No. 1096

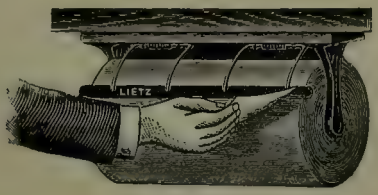
No. 1096 Cutting Knife with adjustable blade..... $0.50
No. 1096A Extra blades for No. 1096 Cutting Knife..... .25

Nos. 1097-98

No. 1097 Handy Paper Cutter, brass $0.35
No. 1098 Handy Paper Cutter, nickel plated..... .40

These tools are used for cutting drawings from the board, also for cutting any kind of paper or bristol board. They can be slid along T-square or straightedge without injuring its edge, and have a thumbscrew adjustment which may be set so as to cut only the thickness of the paper, without marking the drawing board.

HANGING PAPER BRACKETS AND CUTTERS



No. 1099

No. 1099 Hanging Paper Bracket and Cutter.

Size, inches—	6	12	18	24	30	36	42	48
Each	$2.00	$2.25	$2.25	$2.50	$2.50	$2.75	$3.00	$3.00

For Paper Trimmers see page 271.

For prevailing prices see latest supplementary price list.

MOUNTED DRAWING PAPERS IN SHEETS

These Papers are mounted on the best quality muslin to give strength so that they will not tear or break. Specially adapted for maps and valuable drawings and for plat books, etc.

PAPERS MOUNTED ONE SIDE ONLY

No. 1000MS **WHATMAN'S** Selected Best Hand-Made Drawing Paper, **Mounted,** with H. P. (smooth surface) or C. P. (finely grained surface). When ordering, please state size and surface desired.

	Per Quire	Per Sheet
Royal, 19x24 inches	$6.50	$0.30
Imperial, 22x30 inches	9.70	.45
Double Elephant, 27x40 inches	17.30	.80
Antiquarian, 31x53 inches	41.00	1.90

No. 1060MS **"LASSEN"** Drawing Paper, **Mounted.** Same paper as our No. 1060.

	Per Quire	Per Sheet
Royal, 19x24 inches	$6.50	$0.30
Imperial, 22x30 inches	9.70	.45
Double Elephant, 27x40 inches	15.10	.70
Antiquarian, 31x53 inches	23.75	1.10

No. 1064MS **"RAMONA"** Drawing Paper, **Mounted.** Same paper as our No. 1064.

	Per Quire	Per Sheet
Royal, 19x24 inches	$6.90	$0.32
Imperial, 22x30 inches	10.80	.50
Double Elephant, 27x40 inches	16.20	.75
Antiquarian, 31x53 inches	26.00	1.20

DOUBLE MOUNTED DRAWING PAPERS

Double Mounted Papers are especially adapted for Atlas or Map work, having muslin in the middle with paper on both sides.

No. 1000DMS **WHATMAN'S** Selected Best Hand-Made Drawing Paper, **Double Mounted,** with H. P. (smooth surface) or C. P. (slightly grained surface).

When ordering please state size and surface desired.

	Per Quire	Per Sheet
Royal, 19x24 inches	$13.00	$0.60
Imperial, 22x30 inches	19.40	.90
Double Elephant, 27x40 inches	34.60	1.60
Antiquarian, 31x53 inches	82.00	3.80

No. 1060DMS **"LASSEN"** Drawing Paper, **Double Mounted,** same paper as our No. 1060.

	Per Quire	Per Sheet
Imperial, 22x30 inches	$19.40	$0.90
Double Elephant, 27x40 inches	30.20	1.40

No. 1064DMS **"RAMONA"** Drawing Paper, **Double Mounted,** same paper as our No. 1064.

	Per Quire	Per Sheet
Imperial, 22x30 inches	$21.60	$1.00
Double Elephant, 27x40 inches	32.40	1.50

We have a well equipped plant for mounting maps, blue prints, and are prepared to do mounting of any nature. All work guaranteed and orders promptly and accurately executed. Write for estimates.

For prevailing prices see latest supplementary price list.

MOUNTED DRAWING PAPERS IN ROLLS

Mounted one side only on the best quality muslin to give strength so that they will not tear or break.

No. 1060 M **"LASSEN" Drawing Paper, Mounted.** Same paper as our No. 1060.

	Per roll of 10 yds.	Per yd.
36 inches wide	$ 6.65	$0.80
42 inches wide	8.45	1.00
62 inches wide	13.60	1.60

No. 1061 M **"LASSEN" Drawing Paper, Heavy, Mounted.** Same paper as our No. 1061.

	Per roll of 10 yds.	Per yd.
62 inches wide	$14.40	$1.70
72 inches wide	17.35	2.10

No. 1064 M **"RAMONA" Drawing Paper (Eggshell), Mounted.** Same paper as our No. 1064.

	Per roll of 10 yds.	Per yd.
36 inches wide	$ 7.50	$0.90
42 inches wide	9.30	1.10
58 inches wide	12.50	1.45

No. 1065 M **"RAMONA" Drawing Paper, Heavy (Eggshell), Mounted.** Same paper as our No. 1065.

	Per roll of 10 yds.	Per yd.
58 inches wide	$15.70	$1.80

No. 1068 M **"BELMONT" Drawing Paper, Mounted.** Same paper as our No. 1068.

	Per roll of 10 yds.	Per yd.
36 inches wide	$ 7.50	$0.90
58 inches wide	12.50	1.45

No. 1069 M **"BELMONT" Drawing Paper, Heavy, Mounted.** Same paper as our No. 1069.

	Per roll of 10 yds.	Per yd.
58 inches wide	$13.75	$1.60

No. 1070 M **"AVENA" Drawing Paper, Mounted.** Same paper as our No. 1070.

	Per roll of 10 yds.	Per yd.
30 inches wide	$ 5.80	$0.70
36 inches wide	6.20	.75
42 inches wide	7.80	.90
56 inches wide	10.80	1.25
62 inches wide	13.00	1.50

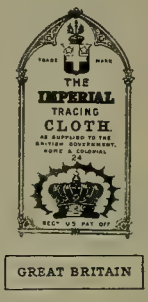
No. 1080 M **"MODOC" Cream Drawing Paper, Mounted.** Same paper as No. 1080.

	Per roll of 10 yds.	Per yd.
30 inches wide	$ 5.65	$0.70
36 inches wide	5.85	.70
42 inches wide	7.50	.90
56 inches wide	9.95	1.15
62 inches wide	12.10	1.40

Complete Sample Book of Drawing Papers mailed on request.

For prevailing prices see latest supplementary price list.

TRACING CLOTHS IN ROLLS



No. 1100 **"EXCELSIOR" Tracing Cloth.** Extra transparent. Glazed on one side and dull on the other.

	Per roll of 24 yds.	Per yd.
30 inches wide	$ 8.75	$0.45
36 inches wide	9.50	.50
42 inches wide	12.25	.60

No. 1101 **"IMPERIAL" Tracing Cloth.** Glazed on one side and dull on the other.

	Per roll of 24 yds.	Per yd.
24 inches wide	$ 7.10	$0.35
30 inches wide	7.55	.40
36 inches wide	8.40	.45
38 inches wide	10.35	.55
41 inches wide	11.30	.60
48 inches wide	14.95	.75
54 inches wide	15.90	.80

No. 1102 **"NATIONAL" Tracing Cloth.** An American product equal to the best imported cloths. Glazed on one side and dull on the other.

	Per roll of 24 yds.	Per yd.
30 inches wide	$ 7.55	$0.40
36 inches wide	8.40	.45
42 inches wide	11.30	.60

No. 1103 **"DOWSES'" Tracing Cloth.** Glazed on one side and dull on the other.

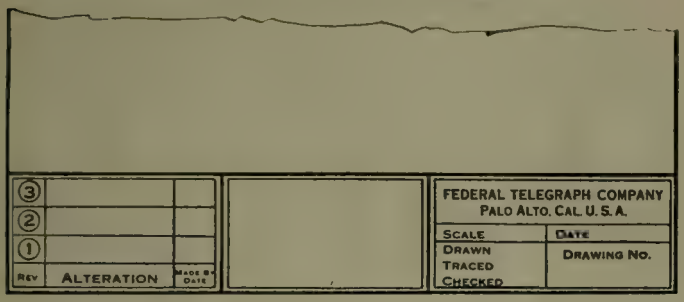
	Per roll of 24 yds.	Per yd.
30 inches wide	$6.10	$0.35
36 inches wide	7.00	.40
42 inches wide	8.50	.45

Samples of any of our Tracing Cloths sent on application.

For prevailing prices see latest supplementary price list.

TRACING CLOTHS IN SHEETS

Printed with borders and titles



The constantly increasing demand of the larger drawing rooms for standard sizes of tracing cloth and tracing paper sheets has induced us to cater to this requirement. We have executed any number of intricate jobs and our experiences are offered the profession with the assurance that highly satisfactory results will be had if this work is entrusted to us. Special non-smearing and absolutely opaque ink used.

We call attention to the illustration above. Note that the printed headings are absolutely in line with the horizontal rulings, also that the lines are unbroken and joined perfectly, an accomplishment unattainable unless executed in our special manner. Sheets printed on the under or reverse side, if desired, to allow for thorough erasing or cleaning without danger of destroying the printed matter.

Considering the time required for ruling borders and inserting corner titles and the saving of material, printed sheets are both efficient and economical. Let us quote you, regardless of size, quantity or intricacy of composition.

TRACING CLOTH REQUISITES

1105

1106

1107

No. 1105 Pounce, or Tracing Cloth Powder, in large tin shaker..... $0.15
No. 1106 Pounce, or Tracing Cloth Powder, in small tin shaker..... .10

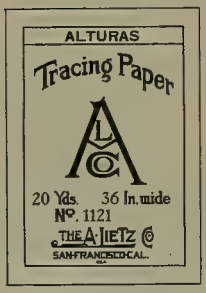
Nos. 1105 and 1106 should be used for removing gloss from Tracing Cloth, which often prevents inks and water colors from adhering properly.

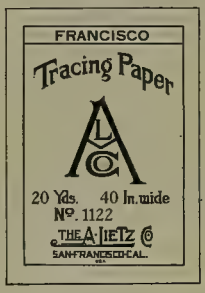
No. 1107 Inkwash. A superior article for removing waterproof ink from Tracing Cloth. In bottles of— 1 pint $3.50 4 oz. $1.00 1 oz. $0.35

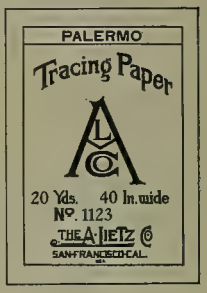
For prevailing prices see latest supplementary price list.

TRACING PAPERS IN ROLLS

A SELECTED ASSORTMENT OF PROVEN MERIT







The papers listed below are intended especially for ink drawings, and each possesses merits of individual character.

No. 1120 **"VELLUM" Tracing Paper.** An exceptionally strong tracing paper. Very transparent. Excellent for ink and water color work. Will not buckle nor become brittle with age. Put up in pasteboard tubes with metal ends.

	Per roll of 20 yds.	Per yard
36 inches wide	$3.50	$0.20
42 inches wide	4.00	.25

No. 1121 **"ALTURAS" Tracing Paper.** A dull finish water-proof tracing paper of exceptional strength and transparency. Bluish tint. Excellent for ink or water color work.

	Per roll of 20 yds.	Per yard
30 inches wide	$2.60	$0.15
36 inches wide	3.20	.20
42 inches wide	3.80	.25

No. 1122 **"FRANCISCO" Tracing Paper.** Bluish tint. A good substitute for tracing cloth, excellent for ink work. Very tough and transparent, and will not deteriorate with age.

	Per roll of 20 yds.	Per yard
40 inches wide	$3.75	$0.25

No. 1123 **"PALERMO" Tracing Paper.** Same as No. 1122 but Ivory tint.

	Per roll of 20 yds.	Per yard
40 inches wide	$3.75	$0.25

No. 1123½ **"PALERMO" Tracing Paper, Thin.** Same as No. 1123 but thinner.

	Per roll of 20 yds.	Per yard
40 inches wide	$3.50	$0.25

No. 1124 **"PARCHMENT" Tracing Paper, Medium.** Very strong and transparent. Takes ink and water color. Will not shrink nor deteriorate.

	Per roll of 20 yds.	Per yard
40 inches wide	$3.50	$0.25

No. 1125 **"PARCHMENT" Tracing Paper, Heavy.** Same as No. 1124 but heavier.

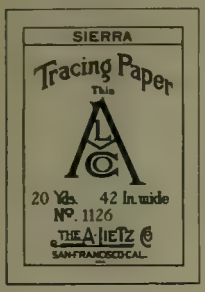
	Per roll of 20 yds.	Per yard
40 inches wide	$4.25	$0.30

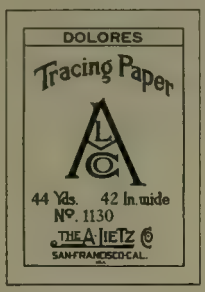
Samples of any of our papers sent on request.

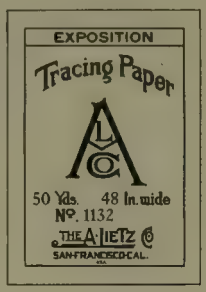
Pasteboard and metal tubes for preserving tracing papers are listed on page 259.

For prevailing prices see latest supplementary price list.

SKETCHING AND DETAIL TRACING PAPERS IN ROLLS







No. 1126 **"SIERRA" Tracing Paper, Thin.** A very transparent white paper, especially adapted for tracing from blue prints. Takes ink and pencil, and is very strong and durable.
No. 1146 is the same paper in sheets.

	Per roll of 20 yds.	Per yard
42 inches wide	$1.50	$0.10

No. 1127 **"SIERRA" Tracing Paper, Medium.** Same as No. 1126 but heavier.

	Per roll of 20 yds.	Per yard
42 inches wide	$2.00	$0.12½

No. 1128 **"SHASTA" Tracing Paper, Thin.** A white paper, very transparent, smooth surface.

	Per roll of 20 yds.	Per yard
42 inches wide	$1.50	$0.10

No. 1129 **"SHASTA" Tracing Paper, Medium.** Same as No. 1128 but heavier.

	Per roll of 20 yds.	Per yard
42 inches wide	$2.00	$0.12½

No. 1130 **"DOLORES" Tracing Paper.** A thin, white, natural tracing paper, unglazed, adapted for pen and ink perspectives. Very strong.

	Per roll of 44 yds.	22 yds.	Per yd.
42 inches wide	$3.60	$1.80	$0.10
57 inches wide	4.60	2.30	.15

No. 1132 **"EXPOSITION" Tracing Paper.** A thin, strong paper for tracing full size details, adapted to pencil only.

	Per roll of 100 yds.	50 yds.	Per yd.
40 inches wide	$2.50	$1.50	$0.05
48 inches wide	3.00	1.75	.05

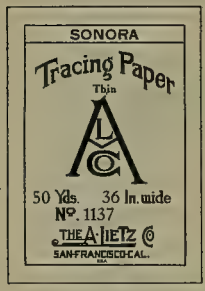
No. 1134 **"VERNALIA" Tracing Paper.** An unglazed, white tracing paper of good strength and transparency.

	Per roll of 20 yds.	Per yard
42 inches wide	$1.35	$0.10

Samples of any of our papers sent on request.

For prevailing prices see latest supplementary price list.

SKETCHING AND TRACING PAPERS IN ROLLS AND SHEETS



No. 1136 **"SONORA" Tracing and Sketching Paper, Medium.** A white paper, strong and tough, especially made for sketching and transferring. Stands erasing and takes pencil, ink and color well.

	Per roll of 50 yds.	Per yard
36 inches wide	$2.40	$0.10
42 inches wide	2.90	.10
62 inches wide	3.60	.15

No. 1137 **"SONORA" Tracing and Sketching Paper, Thin.** Like No. 1136 but considerably thinner and more transparent.

	Per roll of 50 yds.	Per yard
36 inches wide	$2.15	$0.10
42 inches wide	2.65	.10
62 inches wide	3.00	.15

No. 1139 **"MADERA" Tracing and Sketching Paper, Medium.** A white paper, will take ink and color perfectly. Can be used for tracing, adaptable for blueprinting.

	Per roll of 50 yds.	Per yard
36 inches wide	$2.00	$0.10
42 inches wide	2.50	.10
60 inches wide	3.25	.15

No. 1140 **"MADERA" Tracing and Sketching Paper, Heavy.** Like No. 1139 but considerably heavier, used for sketching only.

	Per roll of 20 yds.	Per yard
42 inches wide	$1.80	$0.12½

No. 1145 **"YOSEMITE" Tracing Paper, Extra Thin.** Glazed, often referred to as glass paper. For use of the lithographer, etc.

	Per roll of 20 yds.	Per yard
42 inches wide	$1.35	$0.10

TRACING PAPERS IN SHEETS

No. 1146 **"SIERRA" Tracing Paper, Thin.** A strong, white paper. Very transparent.

	Ream.	Quire.	Sheet
Cap, 20x27 inches	$13.60	$0.80	$0.05
Royal, 27x40 inches	25.50	1.50	.10

"Sierra" Paper in rolls. See Catalog No. 1126.

No. 1147 **"VEGETABLE" Tracing Paper.** Very transparent and fairly strong.

	Ream.	Quire.	Sheet
Cap, 13x17 inches	$15.30	$0.90	$0.05
Royal, 19x25 inches	34.00	2.00	.10
Imperial, 22x28 inches	42.50	2.50	.12½

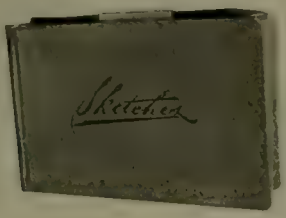
No. 1148 **"CRANE'S BOND" Paper, Unglazed.** In 3 thicknesses.

	Ream.	Quire.	Sheet
Size 27x40 inches, Thin	$37.40	$2.20	$0.10
Size 27x40 inches, Medium	54.40	3.20	.15
Size 27x40 inches, Heavy	61.20	3.60	.20

Other sizes quoted on request.

Samples of any of our papers will be mailed upon application.

SKETCH BOOKS AND BLOCKS



No. 1155 **SKETCH BOOKS,** stiff canvas covered, containing 24 leaves of good quality white drawing paper with slightly grained surface.

Inches—	4x7	5½x8	6x9	7½x10	9x11	10x14
Dozen	$2.50	$3.00	$3.60	$4.50	$5.50	$7.50
Each	.25	.30	.35	.45	.55	.75

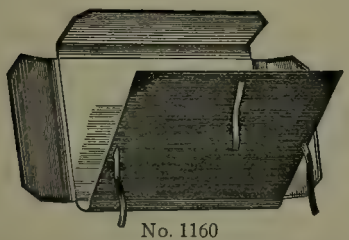
No. 1157 **WHATMAN'S** Solid Sketch Blocks. Made of Whatman's Selected Best Drawing Paper so compressed as to form a solid block. Each sheet can easily be detached by running a knife around the edge. In three surfaces: H. P. (smooth), C. P. (finely grained) or R. (rough). When ordering state surface desired. 24 sheets to pad.

Inches—	4½x6	5x7	6x9	7x10	9x12	10x14	12x18	15x21
Dozen	$3.00	$3.75	$5.25	$7.50	$9.00	$15.00	$16.80	$28.20
Each	.30	.40	.50	.75	.90	1.50	1.70	2.75

No. 1158 **"PACIFIC"** Sketch Blocks. Made of No. 1007 "Pacific" White Drawing Paper. 24 sheets to pad.

Inches—	4½x6	5x7	6x9	7x10	9x12	10x14	12x18	14x20
Dozen	$1.80	$2.40	$3.60	$4.80	$5.40	$8.00	$10.00	$15.00
Each	.20	.25	.35	.50	.55	.80	1.00	1.50

PORTFOLIOS



No. 1160

No. 1160 Portfolios, cloth sides, leather back and corners, with three flaps.

Inches—	12x16	14x18	17x22	20x26	23x31
Each	$1.00	$1.25	$1.50	$2.00	$2.50

No. 1161 Portfolios, paper sides, cloth back and corners, with three flaps.

Inches—	12x16	14x18	17x22	20x26	23x31
Each	$0.50	$0.65	$0.75	$1.00	$1.50

No. 1162 School Portfolios, paper sides, cloth back and corners, without flaps. Size 20x26 in.
Each $0.75

BLUE PRINT PAPERS

Our Blue Print Papers are coated fresh for our patrons on receipt of order. We use only the purest chemicals and guarantee every yard.

Your attention is directed to the various printing speeds with which we prepare our papers. When ordering kindly state which of the following four solutions is desired:

"REGULAR" for sun printing or blue line work.

"BLUELINE," a special medium-rapid solution especially suited for printing from negatives.

"RAPID" for fast printing in daylight.

"ELECTRIC RAPID" for electric printing or for use on dark days.

No. 1180 **"APOLLO" Blue Print Paper, Medium Thick.** A good strong paper, in the bath and out, for general printing. Rich blue tone, will wash pure white.

Inches wide—	30	36	42
Per roll of 10 yards	$0.70	$0.80	$0.90
Per roll of 50 yards	3.00	3.50	4.00

No. 1181 **"STEORRA" Blue Print Paper, Thin.** This paper is especially adapted for mailing purposes.

Inches wide—	30	36	42
Per roll of 10 yards	$0.80	$0.95	$1.10
Per roll of 50 yards	3.35	4.00	4.70

No. 1182 **"VELVET" Blue Print Paper, Medium Thick.** A first-class paper. Will withstand much handling, and serve well as records.

Inches wide—	30	36	42
Per roll of 10 yards	$0.95	$1.10	$1.20
Per roll of 50 yards	4.00	4.70	5.35

No. 1183 **"ALCO" Blue Print Paper, Medium Thick.** Finest quality, especially well adapted for blue line work.

Inches wide—	30	36	42	54
Per roll of 10 yards	$1.25	$1.50	$1.70	$2.60
Per roll of 50 yards	6.00	6.60	7.70	11.65

Samples of any of our papers will be mailed upon application.

For prevailing prices see latest supplementary price list.

BLUE PRINT PAPERS

When ordering kindly state which solution is wanted. See heading page 254.

No. 1184 **"PARCHMENT" Blue Print Paper, Thin.** The best and strongest paper made, very tough and durable. Will stand much handling and is ideal for permanent record filing.

Inches wide—	24	30	36	42	54
Per roll of 10 yards.....	$1.05	$1.25	$1.40	$1.60	$2.40
Per roll of 50 yards.....	4.40	5.35	6.15	7.00	10.40

No. 1185 **"PARCHMENT" Blue Print Paper, Medium Thick.** Same quality as No. 1184, but heavier.

Inches wide—	24	30	36	42
Per roll of 10 yards.....	$1.35	$1.60	$1.90	$2.10
Per roll of 50 yards.....	5.70	7.00	8.05	9.35

No. 1186 **"WAWONA" Special Blue Line Paper, Medium Thick.**

Inches wide—	30	36	42	54
Per roll of 10 yards.....	$1.75	$2.00	$2.30	$3.00
Per roll of 50 yards.....	7.00	8.35	9.70	12.65

No. 1187 **"DIABLO" Photographic Blue Print Paper.** Especially adapted for glass negative work, or for work where fine detail is desired.
Per roll of 10 yards, 25 inches wide..... $3.00

~~ALCO~~ BLUE PRINT CLOTHS

No. 1190 **"ALCO" Blue Print Cloth, Medium.**

Inches wide—	30	36	42	54
Per roll of 10 yards	$2.90	$3.20	$4.40	$6.00

No. 1191 **"ALCO" Blue Print Cloth, Thin.**

Inches wide—	30	36	42
Per roll of 10 yards	$3.70	$4.00	$5.20

In ordering kindly state which solution is wanted.

~~ALCO~~ BLUE PRINT INTENSIFIER

For developing overexposed prints and treatment of blue line prints to intensify the blue and to clarify the white background. In crystal form.

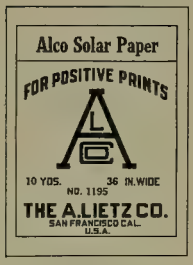
No. 1193 **Alco Blue Print Intensifier.** Per pound.....$0.50

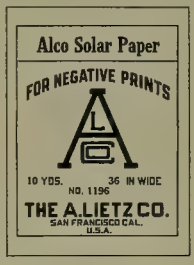
For prevailing prices see latest supplementary price list.

SOLAR PAPERS AND CLOTHS

For Negative and Positive Printing

Sufficient developing salt furnished with each roll.





No. 1195 **"ALCO" Solar Paper, Medium Thick.** For Positive Prints.

Inches wide—	30	36	42	54
Per roll of 10 yards	$1.75	$2.00	$2.25	$4.00
Per roll of 50 yards	8.50	9.75	11.00	19.50

No. 1196 **"ALCO" Solar Paper, Thin.** For Negative Prints.

Inches wide—	30	36	42	54
Per roll of 10 yards	$1.75	$2.00	$2.25	$4.00
Per roll of 50 yards	8.50	9.75	11.00	19.50

No. 1197 **"ALCO" Solar Cloth, Medium Thick.** For Positive Prints.

Inches wide—	30	36	42	54
Per roll of 10 yards	$4.00	$4.50	$5.75	$9.50

No. 1198 **"ALCO" Solar Cloth, Thin.** For Negative Prints.

Inches wide—	30	36	42
Per roll of 10 yards	$5.00	$5.50	$6.60

~~ALCO~~ FIXING SALT

For intensifying and fixing prints.

No. 1200—2-ounce can	$0.10
No. 1201—4-ounce can	.15
No. 1202—1-pound can	.40

~~ALCO~~ TRANSPARENTIZING FLUID

For treating negatives to allow faster printing, or making regular drawings transparent for printing.

No. 1205—1-quart can	$1.00
No. 1206—½-gallon can	1.75
No. 1207—1-gallon can	3.00

For prevailing prices see latest supplementary price list.

DIRECT PROCESS PAPERS

No. 1210 **"CAPITOLA" Direct Blue Line Paper, Medium Thick.** An excellent paper giving good clear, permanent prints. Directions, Developer and Fixing Salts furnished with each roll.

Inches wide—	30	36	42
Per roll of 50 yards	$6.25	$7.25	$8.25

No. 1211 **"CAPITOLA" Direct Blue Line Paper, Thin.**

Inches wide—	30	36	42
Per roll of 50 yards	$6.00	$7.00	$8.00

No. 1215 **"ARCOLA" Direct Black Line Paper, Medium Thick.** Is washed exactly like blue print paper, requires but one water bath, no chemical bath necessary. Will print sharp, clear black lines on a white background. Will keep fresh for several months and will not become brittle with age.

Inches wide—	30	36	42
Per roll of 10 yards	$2.50	$3.00	$3.50

No. 1216 **"ARCOLA" Direct Black Line Paper, Thin.**

Inches wide—	30	36	42
Per roll of 10 yards	$2.50	$3.00	$3.50

~~ALCO~~ ERASING FLUIDS

For making alterations on Blue Prints or Negatives.

No. 1220 White, for Blue Prints; per bottle	$0.20
No. 1221 Red, for Blue Prints; per bottle	.20
No. 1221 Yellow, for Blue Prints; per bottle	.20
No. 1222 Green, for Blue Prints; per bottle	.20
No. 1223 White, for Negative Prints; per bottle	.20

White pencils for marking blue prints listed on page 515.

OPAQUES

For correcting mistakes and faults in negatives.

No. 1225 Liquid Opaque; per 1-ounce bottle	$0.35
No. 1226 Opaque in tubes, ¾x2; per tube	.25
No. 1227 Gihon's Opaque in cakes; per cake	.50

For prevailing prices see latest supplementary price list.

UNPREPARED BLUE PRINT PAPER AND CLOTHS

While these papers and cloths are primarily intended to be coated with a chemical solution for blue-printing purposes, etc., they are admirably adapted for use as drawing papers or cloths. Each paper is a specially selected stock, the best in its particular class. We especially recommend our Nos. 1184U and 1185U "Parchment" Papers, which are excellent for pencil, ink or water color work. Nos. 1190U and 1191U "Alco Cloths" will also take ink or water color.

No. 1180U **"APOLLO,"** medium thick, unprepared.

Inches wide—	30	36	42
Per 50-yard roll	$2.00	$2.50	$3.00

No. 1181U **"STEORRA,"** thin, unprepared.

Inches wide—	30	36	42
Per 50-yard roll	$2.35	$3.00	$3.65

No. 1182U **"VELVET,"** medium thick, unprepared.

Inches wide—	30	36	42
Per 50-yard roll	$2.65	$3.35	$4.00

No. 1183U **"ALCO,"** medium thick, unprepared.

Inches wide—	30	36	42	54
Per 50-yard roll	$4.20	$4.85	$5.65	$7.65

No. 1184U **"PARCHMENT,"** thin, unprepared.

Inches wide—	30	36	42	54
Per 50-yard roll	$3.55	$4.00	$4.85	$6.60

No. 1185U **"PARCHMENT,"** medium thick, unprepared.

Inches wide—	30	36	42
Per 50-yard roll	$5.35	$6.20	$7.00

No. 1190U **"ALCO CLOTH,"** medium thick, unprepared.

Inches wide—	30	36	42	54
Per 10-yard roll	$2.40	$2.70	$3.80	$4.60

No. 1191U **"ALCO CLOTH,"** thin, unprepared.

Inches wide—	30	36	42
Per 10-yard roll	$3.20	$3.50	$4.60

For prevailing prices see latest supplementary price list.

MAILING AND STORAGE TUBES

No. 1231

Made of tin for storing prepared papers and cloths, excluding light and moisture.

Inches long—	31	37	43	55
No. 1230 For 10-yard rolls (2-in. diameter) ea...	$0.95	$1.00	$1.10	$1.80
No. 1231 For 50-yard rolls (4-in. diameter) ea...	1.10	1.25	1.35	2.00

No. 1232

Made of stout pasteboard, with screw metal ends.

Inches long—	32	37	43
No. 1232 2¾ in. diameter; ea.....	$0.30	$0.35	$0.45

TELESCOPE MAILING TUBES

Made of plain strawboard.

Inches long—	12	16	18	24	30	36	42	48
No. 1235 1 in. diam.; ea.	$0.05	$0.10	$0.10	$0.10	$0.15	$0.15	$0.15	$0.15
doz.	.50	.75	.80	1.00	1.15	1.35	1.40	1.50
No. 1236 1½ in. diam.; ea.	.10	.10	.15	.15	.20	.20	.20	.25
doz.	.85	1.05	1.15	1.40	1.70	2.00	2.25	2.50
No 1237 2 in. diam.; ea.	.10	.15	.15	.20	.20	.25	.30	.35
doz.	1.05	1.30	1.50	1.90	2.35	2.75	3.20	3.60
No. 1238 3 in. diam.; ea.	.15	.20	.20	.25	.30	.40	.45	.50
doz.	1.40	1.85	2.05	2.70	3.40	4.05	4.70	5.40

MAILING TUBES

Open ends, plain strawboard, spiral.

Inches long—	12	15	18	24	30	36	42
No. 1240 1 in. diameter; ea.	$0.05	$0.05	$0.05	$0.05	$0.05	$0.10	$0.10
doz.	.25	.25	.35	.40	.50	.60	.70
No. 1241 1½ in. diameter; ea.	.05	.05	.05	.05	.10	.10	.10
doz.	.35	.35	.40	.50	.60	.70	.90
No. 1242 2 in. diameter; ea.	.05	.05	.05	.10	.10	.10	.15
doz.	.40	.50	.55	.70	.85	1.10	1.20
No. 1243 2½ in. diameter; ea.	.05	.05	.10	.10	.10	.10	.15
doz.	.50	.55	.65	.75	.90	1.10	1.35
No. 1244 3 in. diameter; ea.	.10	.10	.10	.10	.10	.15	.15
doz.	.60	.65	.70	.85	1.00	1.20	1.45

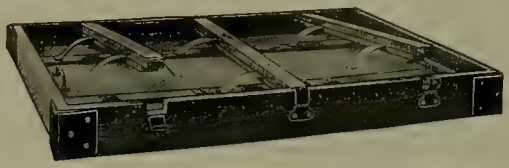
Prices on large quantities or special mailing tubes furnished upon request.

For prevailing prices see latest supplementary price list.

BLUE PRINT FRAMES

FIRST QUALITY

Our Blue Print Frames are made of well seasoned oak, and are of the best workmanship. Finished in three-coat Golden Oak and black backs. Equipped with oil-tempered steel springs, iron corner plates and special bar catches which are rapidly operated without bruising the fingers.



	Clear Printing Surface	Outside Dimensions	Frame Only	Frame with Felt Pad	Frame with Pad and Polished Plate Glass
No. 1265—	20x 26	24 x30 x4¼	$10.50	$11.50	$14.00
	24x 30	28 x34 x4¼	11.00	13.00	17.75
	30x 42	34 x46 x4¼	17.25	19.25	27.25
	36x 42	40 x46 x5½	19.80	22.25	31.75
	36x 48	40 x52 x5½	21.80	24.75	35.75
	36x 54	40 x58 x5½	25.75	29.00	43.00
	36x 60	40 x64 x5½	29.70	33.75	50.00
	42x 60	46½x64½x6	32.60	38.50	57.00
	42x 72	46½x76½x6	37.40	43.25	66.00
	42x 84	46½x88½x6	43.50	50.75	77.25
	48x100	53 x105 x6½	60.00	68.75	105.75

All above prices are F. O. B. San Francisco and cover crating for shipment.
Shipping weight, about 10 lbs. per square foot.

INSURANCE

Unless instructed to the contrary we insure plate glass against breakage.
We are not responsible for breakage of glass in transit.
For Cars and Tracks for Blue Print Frames see pages 264 and 265.

FELT FOR BLUE PRINT FRAMES

No. 1266 Heavy Felt. Per square foot $0.40
No. 1267 Light Felt. Per square foot ..... .50

For prevailing prices see latest supplementary price list.

BLUE PRINT FRAMES

SECOND QUALITY

These Frames are similar to our No. 1265 line but without iron corner plates.

	Clear Printing Surface	Outside Dimensions	Frame Only	Frame with Felt Pad	Frame with Pad and Polished Plate Glass
No. 1270—	20x26	23x29x4¼	$ 8.35	$ 9.35	$11.85
	24x30	27x33x4¼	10.00	11.00	15.75
	30x42	33x45x4¼	15.00	17.00	25.00
	36x42	39x45x5½	17.75	20.25	29.75
	36x48	39x51x5½	19.75	22.75	33.75
	36x54	39x57x5½	23.75	27.00	41.00
	36x60	39x63x5½	27.50	31.50	47.75

For Cars and Tracks for Blue Print Frames see pages 264 and 265.

COMMERCIAL BLUE PRINT FRAMES

Made of well seasoned white wood, locked corners, shellac finish. With oil-tempered steel springs, spring brass catches. A strong, light frame which can be easily handled.

No. 1267

	Clear Printing Surface	Outside Dimensions	Frame Complete with Felt Pad and Double Thick Glass
No. 1271—	12x16	13½x17½	$ 4.40
	16x21	17½x22½	7.00
	20x26	21½x27½	9.35
	24x32	25½x33½	12.20

All above prices are F. O. B. San Francisco and cover crating for shipment.

Shipping weight, about 10 lbs. per square foot.

INSURANCE

Unless instructed to the contrary we insure plate glass against breakage. We are not responsible for breakage of glass in transit.

VACUUM BLUE PRINT FRAMES

No. 1275

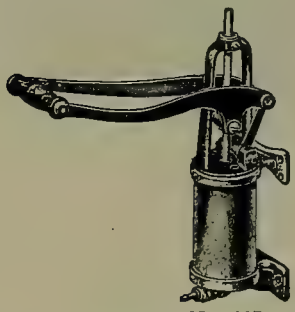
For obtaining the closest contact these frames are unsurpassed. By means of a pump the air is entirely exhausted from between the cushion and the glass, forming the best contact obtainable between the tracing and sensitized paper.

By use of the vacuum frame the faintest lines of a drawing can be reproduced, or drawings wrinkled or worn by much handling can be flattened out and good prints taken therefrom.

This frame is particularly well adapted for making negative and blue line prints.

		Printing Surface	Inside Dimensions	Without Glass	With Plate Glass
No. 1275	**Vacuum Frame.**	30x42	32x44 ea.	$66.00	$76.00
	Prices F. O. B.	36x48	38x50 ea.	77.50	96.50
	San Francisco	36x60	38x62 ea.	86.50	110.00
		42x72	45x75 ea.	117.00	151.00

VACUUM EXHAUST OUTFITS



No. 1276

No. 1276 **Vacuum Outfit,** consisting of strongly built hand pump, with necessary brackets for fastening to wall or floor..... $10.00

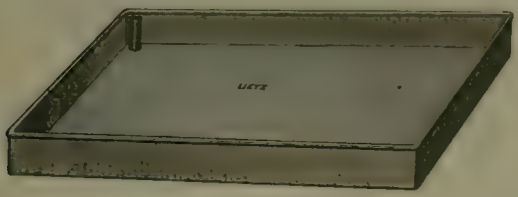
No. 1277 **Vacuum Outfit,** consisting of Motor for 110-volt direct current, and single acting pump, mounted on base..... 60.00

No. 1278, same as No. 1277, but motor for 110-volt alternating current 67.50

No. 1279 **Vacuum Outfit,** consisting of Motor for 110-volt direct current, with large steel tank with gauge, and double acting pump 200.00

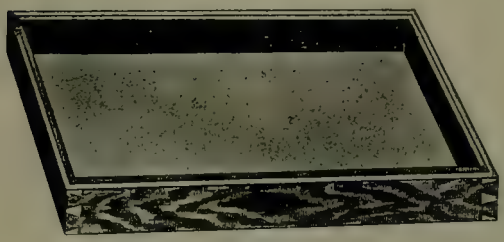
For prevailing prices see latest supplementary price list.

ZINC BATH TRAYS



No. 1280

No. 1280	Plain Zinc Bath Tray with strongly wired rim and drain pipe, 12x17 inches	$2.00
	17x22 inches	2.50
	20x24 inches	3.50
	24x30 inches	5.00



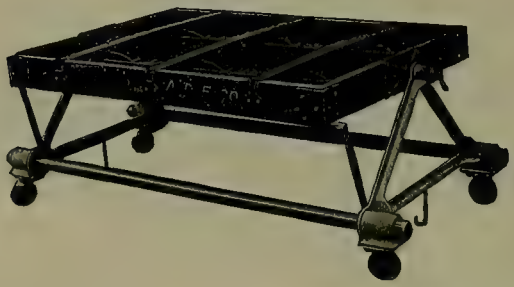
No. 1281

No. 1281	Zinc Bath Tray with strongly wired rim, drain pipe and wooden braces, 20x24 inches	$4.75
	24x30 inches	6.25
	30x42 inches	8.75
	36x48 inches	11.00
	36x60 inches	12.50
	42x60 inches	15.00
	42x72 inches	18.00

All above prices are F. O. B. San Francisco and cover cost of crating for shipment.

For prevailing prices see latest supplementary price list.

BLUE PRINT CARS



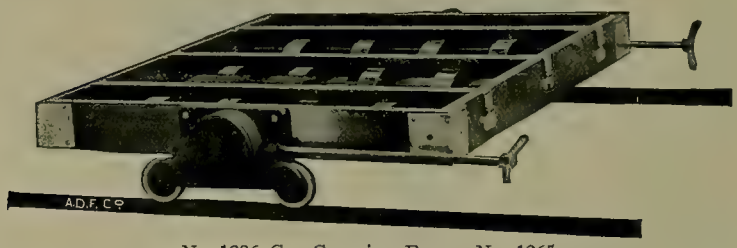
No. 1285 Car Carrying Frame No. 1265.

These frames may be used with or without tracks and carry the largest frames with ease. Cars are finished in black baked enamel and are made of strong iron. The frames revolve and can be clamped at any angle. The frame is firmly held in position for loading as shown in the illustration. The brace swings back and drops into the guards at the center, thus allowing the frame to revolve.

When ordering car only, give outside dimensions of your frame. State whether for use on track.

	Approximate Shipping Wt.	Price Car only
No. 1285A Car for frames up to and including 30x42 in.....	140 lbs.	$36.00
No. 1285B Car for frames up to and including 42x72 in.....	150 lbs.	42.00
No. 1285C Car for frames up to and including 48x100 in.....	160 lbs.	54.00

For Tracks for the above cars see opposite page.



No. 1286 Car Carrying Frame No. 1265.

A very convenient car for carrying a frame on a track which extends through a window or other opening above the floor.

When ordering car with frame give width of opening through which it is to pass; car only, give also outside dimensions of frame.

	Approximate Shipping Wt.	Price Car only
No. 1286A Car for frames up to and including 36x42 in.....	15 lbs.	$16.00
No. 1286B Car for frames up to and including 42x72 in.....	50 lbs.	21.50
No. 1286C Car for frames up to and including 48x100 in.....	70 lbs.	31.00

For Tracks for the above cars see opposite page.

All above prices are F. O. B. San Francisco and cover crating for shipment.

For prevailing prices see latest supplementary price list.

BLUE PRINT CARS WITH TURNTABLE

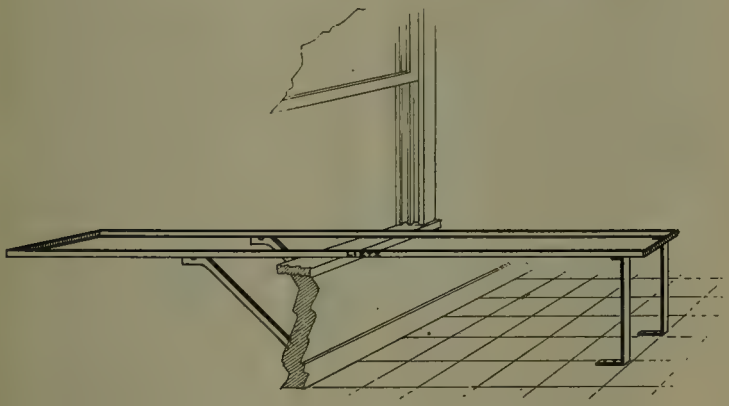
Blue Print Cars similar to Nos 1285A-1285C can be furnished with a turntable permitting of the turning of the frame to receive the direct rays of the sun.

When ordering car only, give outside dimensions of your frame.

	Approximate Shipping Wt.	
No. 1285AT Car and turntable for frames up to and including 30x42 in...	180 lbs.	$59.50
No. 1285BT Car and turntable for frames up to and including 42x72 in...	180 lbs.	65.50
No. 1285CT Car and turntable for frames up to and including 48x100 in..	185 lbs.	77.50

The above prices are for car and turntable only. Blue print frames listed on pages 260 and 261.

TRACK FOR BLUE PRINT CARS



Illustrating track for carrying blue print car through window for outside exposure.

	Approximate Shipping Wt.	Price Track only
No. 1287A Iron Track for blue print car No. 1285A.....	50 lbs.	$12.00
No. 1287B Iron Track for blue print car No. 1285B.....	50 lbs.	18.00
No. 1287C Iron Track for blue print car No. 1285C.....	50 lbs.	19.00
No. 1288A Iron Track for blue print car No. 1286A.....	50 lbs.	12.00
No. 1288B Iron Track for blue print car No. 1286B.....	50 lbs.	18.00
No. 1289C Iron Track for blue print car No. 1286C.....	50 lbs.	19.00

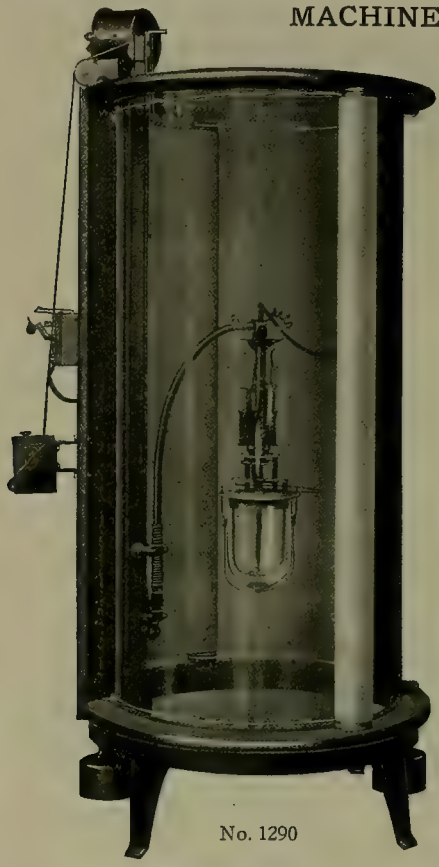
All above prices are F. O. B. San Francisco and include all necessary brackets, bolts, etc., for attaching, and cover crating for shipment.

IMPORTANT

When ordering blue print car and track please state height and width of your window when open, width of window sill, height of window sill from floor, and thickness of wall. Also state size of your blue print frame when not ordering new frame.

For prevailing prices see latest supplementary price list.

THE NEW BUCKEYE ELECTRIC BLUE PRINT MACHINE



No. 1290

Of the various types of cylindrical Blue Print Machines which have been offered we are convinced that the NEW BUCKEYE is the most practical from the standpoint of operation, the most economical from a viewpoint of operation cost and the most satisfactory from results obtainable.

An advantage of this machine is that it can be purchased with but one half-cylinder glass; the other, to complete the machine, may be added later. This is an advantage where the first cost is a consideration.

The half-cylinders are each provided with a curtain to hold tracings and paper tightly against the glass during exposure, perfect contact being assured. Tension on the curtains is maintained by means of weights attached to small wire cables which engage both ends of the rollers. A roller being used on each side of the machine makes it possible to operate one independent of the other, thus one side only may be used or one side may be unloaded or reloaded while the other is printing.

LAMP—Especially constructed for blue printing, emitting an intense light, rich in actinic or violet rays.

SPEED GOVERNOR, for regulating the length of exposure, is of the rotary type in an oil-tight case. The weight of the lamp supplies the power.

SAFETY STOP—A device to prevent lamp from dropping in case supporting cable should break.

AUTOMATIC CUT-OUT — Provided to make it unnecessary for operator to continually watch machine, the current being automatically shut off when lamp reaches bottom.

When ordering ascertain from your electric company whether current is direct or alternating; if latter give frequency of cycles.

COMPLETE WITH TWO HALF-CYLINDER GLASSES

	Height.	Capacity.	Approximate Shipping Wt.	
No. 1290 New Buckeye Machine.....	7′ 4″,	2 prints, 42x44 in.	1000 lbs.	$172.00
No. 1291 New Buckeye Machine.....	8′ 10″,	2 prints, 42x60 in.	1200 lbs.	212.50
No. 1292 New Buckeye Machine.....	9′ 10″,	2 prints, 42x72 in.	1400 lbs.	252.50

WITH ONE HALF-CYLINDER GLASS ONLY

No. 1290½, same as No. 1290 but capacity only 1 print, 42x44 in..... $157.50
No. 1291½, same as No. 1291 but capacity only 1 print, 42x60 in..... 195.00
No. 1292½, same as No. 1292 but capacity only 1 print, 42x72 in..... 235.00

Prices quoted are F. O. B. Salem, Ohio, and cover boxing for shipment.

INSURANCE

Unless instructed to the contrary, we insure the glass against breakage.
We are not responsible for breakage of glass in transit.
Complete folder fully describing the New Buckeye Blue Print Machine cheerfully forwarded on request.
For prevailing prices see latest supplementary price list.

THE REVOLUTE BLUE PRINTING MACHINES

The efficiency of the Revolute Blue Printing Machines is due to the fact that they are built upon the right principle, the principle of rolling (revolving) contact.

Rolling contact is obtained by a revolving glass cylinder and a series of endless belts which move in the same direction at the same rate of speed and have perfect contact.

The source of light passes through the glass cylinder and hits the tracing and paper which is fed between the cylinder and the endless belts and carried by them through the part revolution while the printing is being done.

Rolling contact insures perfect and uniform contact between the tracing and the paper at all times which is essential in making prints perfect in detail and tone, and absolutely eliminates all tendency of the paper to slip on the tracing.

The Revolute Blue Printing Machines will produce blue prints at the rate of two to twenty linear feet per minute, depending upon the quality of the paper and the tracing. The cost of operation per unit of output is extremely low and they are very economical to maintain and always ready for instant use, self-contained and compact.

They will make a perfect reproduction of every tracing or negative regardless of its fineness of detail. They will print either separately cut sheets or continuous rolls from either cloth or paper tracings.

They are devoid of complicated mechanism and are simply constructed and easily operated.

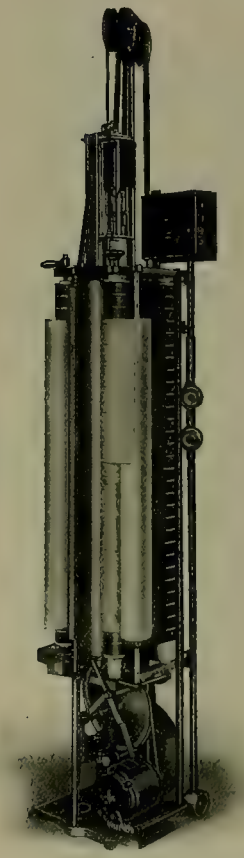
On the Revolute Blue Printing Machines you will find every attachment that can be designed to aid their speed and efficiency. They are provided with variable speed gears with indicators which enables the operator to set the machine at the right speed for every variation in paper and tracings, insuring all prints perfect with no loss of time and material for tests. They are equipped with paper holders to which the paper may be attached and from which it will automatically feed into the machine.

The very fast machines are, and the others may be, equipped with an automatic winding-up device which will rewind the paper as it is delivered printed from the machine.

All machines are provided with automatic strippers which insure the paper and the tracing leaving the cylinder at the proper moment.

If interested in Washing, Drying and Ironing Machines or other blue print room equipment send for descriptive circular.

REVOLUTE BLUE PRINTING MACHINES



No. 1295-1295A

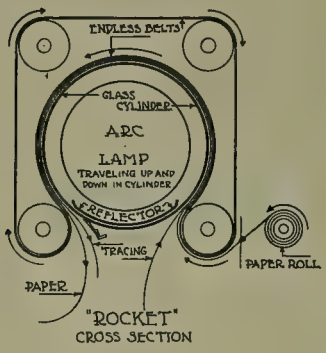
Over-All Dimensions

20x20 in.; with tracing catcher 20 in. by 3 ft. 5 in.
Height 8 ft. 6 in.

ROCKET PRINTERS

Specifications

Printing width 44 in.
Motor 1/6 H. P.
Lamp equipment 1 arc lamp.
Speed of printing up to 7 linear feet per minute.
Power consumption about 1¾ K. W.
Tracing catcher extra.



"ROCKET" CROSS SECTION

No. 1295 Rocket Printer with single direct current arc lamp for approx. 110 or approx. 220 volts $420.00

No. 1295A Rocket Printer with single alternating current arc lamp for approx. 110 or approx. 220 volts, 60-cycle 435.00

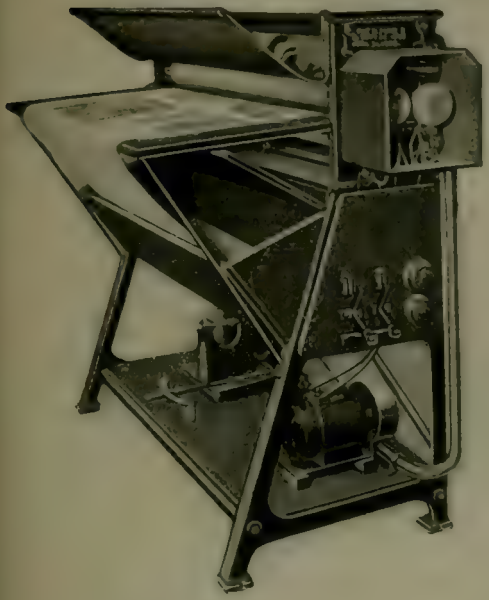
Any other voltage or cycle special.

Extra Parts for Rocket Printers

No. 1296A Cored Carbons for Lamp, 16x½ in. Per 100 ..... $10.00
No. 1296B Solid Carbons for Lamp, 16x½ in. Per 100 ..... 10.00
No. 1296C Glass Globes for Lamp. Each 1.50

Above prices are F. O. B. New York City and cover crating for shipment.

REVOLUTE BLUE PRINTING MACHINES



No. 1297-1298A

THE EVERETT-McADAM PRINTERS

Specifications:

Printing width 45 in. and 60 in.

Motor 1/6 H. P.

Lamp equipment, 2 15-amp. Mercury Vapor Lamps.

Speed of printing up to 8 linear feet per minute.

Power consumption about 3½ K. W.

Equipment: With or without feed table. Automatic wind-up extra.

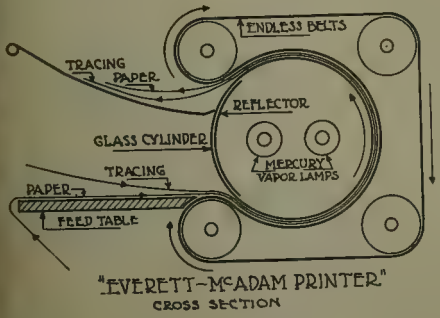
Over-All Dimensions

45-INCH MODEL

2 ft. 6 in. by 5 ft. 8 in. Height, 4 ft. 10 in.

60-INCH MODEL

2 ft. 6 in. by 6 ft. 8 in. Height, 4 ft. 10 in.



"EVERETT-McADAM PRINTER"
CROSS SECTION

No. 1297 Everett-McAdam Machine, 45 inch with direct current M. V. lamps for approx. 110 or approx. 220 volts..$1000.00

No. 1297A Everett-McAdam Machine, 45 inch, with alternating current M. V. lamps for approx. 110 or approx. 220 volts, 60-cycle 1085.00

No. 1298 Everett-McAdam Machine, 60 inch, with direct current M. V. lamps for approx. 110 or approx. 220 volts.. 1120.00

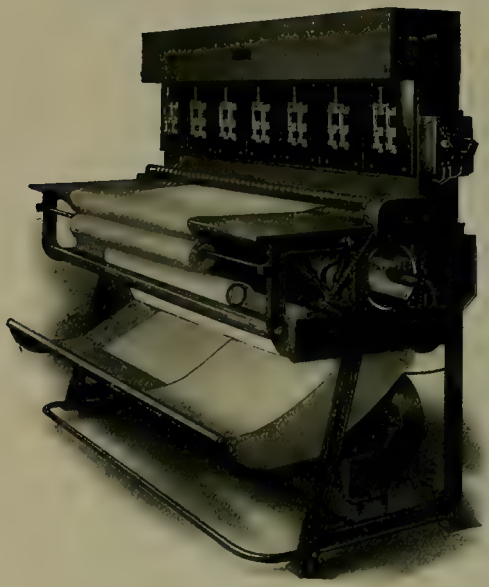
No. 1298A Everett-McAdam Machine, 60 inch, with alternating current M. V. lamps for approx. 110 or approx. 220 volts, 60-cycle 1205.00

Any other voltage or cycle special.

Above prices are F. O. B. New York City and cover crating for shipment.

For prevailing prices see latest supplementary price list.

REVOLUTE BLUE PRINTING MACHINES



BLUE STREAK PRINTERS

Specifications:

Printing width 45 in. and 60 in.

Motor ¼ H. P.

Lamp equipment 4 or 6 arc lamps.

Speed of printing up to 20 linear feet per minute.

Power consumption about 14 K. W.

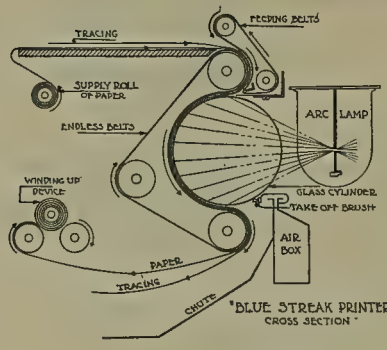
Over-All Dimensions

45-IN. MODEL

3 ft. 3 in. by 5 ft. 1½ in. Height 5 ft. 3 in.

60-IN. MODEL

3 ft. 3 in. by 6 ft. 8½ in. Height 5 ft. 3 in.



"BLUE STREAK PRINTER" CROSS SECTION

No. 1300 Blue Streak Machine, 45 in., with four direct current arc lamps for approx. 110 or approx. 220 volts $1150.00

No. 1300A Blue Streak Machine, 45 in., with four alternating current arc lamps for approx. 110 or approx. 220 volts, 60-cycle 1165.00

No. 1301 Blue Streak Machine, 60 in., with six direct current arc lamps for approx. 110 or approx. 220 volts 1285.00

No. 1301A Blue Streak Machine, 60 in., with six alternating current arc lamps for approx. 110 or approx. 200 volts, 60-cycle 1305.00

Any other voltage or cycle special.

Extra Parts for Blue Streak Printers

No. 1306A Cored Carbons for lamps, 16x½ in. Per 100 ..... $10.00
No. 1306B Solid Carbons for lamps, 16x½ in. Per 100 ..... 10.00
No. 1306C Glass Globes for lamps. Each 1.50

Above prices are F. O. B. New York City and cover crating for shipment.

For prevailing prices see latest supplementary price list.

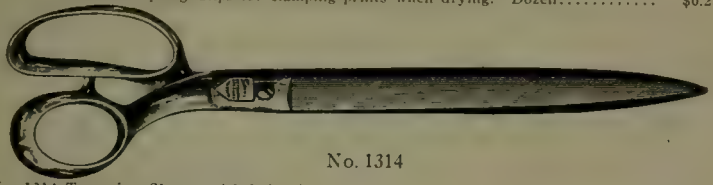
BLUE PRINT ROOM REQUISITES

No. 1310

	Doz.	Each
No. 1310 ALCOCLIPS for hanging wet prints for drying.....	$2.00	$0.20

ALCOCLIPS are a most practical device for hanging wet prints. They grasp instantly and tightly and admit of instant releasing when prints become dry. By suspending on wire line they may readily be adjusted to width of print. Ideal for profiles and extra large prints. Indestructible, therefore economical.

No. 1312 Wooden Spring Clips for clamping prints when drying. Dozen..... $0.25



No. 1314

No. 1314 Trimming Shears, nickel-plated.

Size, inches—	8	10	12	13	14	15	16	18
Each	$0.75	$1.25	$1.50	$1.75	$2.00	$2.25	$2.60	$3.75

No. 1316

No. 1316 Print Trimmers, highest quality, curved steel blade, polished hardwood board.

Size of blade, inches—	8	10	12	15	18	24
Each	$2.00	$3.00	$4.00	$7.25	$11.00	$18.00

No. 1317

No. 1317 "Crescent" Paper Trimmer, 33-inch. blade, for attaching to end of cutting table, each $15.00

PROCESS PRINTING & MAP MOUNTING

We have every facility for the prompt duplicating of drawings and tracings. Work entrusted to us will receive most careful attention.

BLUE PRINTING

	Per sq. ft.
Paper prints from transparent drawings up to 42 in. wide	$0.02
Paper prints from transparent drawings over 42 in. wide	.04
Paper prints from opaque drawings up to 42 in. wide	.04
Paper prints from profile tracing paper or cloth	.04
Paper prints from profile drawing cloth	.06
Paper prints from "Specifications" in lots of 25 or more, each	.04

Minimum charge for printing, 10c each print.

Cloth prints from transparent drawings up to 42 in. wide	.06
Cloth prints from transparent drawings over 42 in. wide	.08

Minimum charge, 20c each print.

BLUE-LINE PRINTING FROM NEGATIVES

Paper prints from negatives up to 42 in. wide	$0.05
Paper prints from negatives over 42 in. wide	.07

Minimum charge, 10c each print.

Cloth prints from negatives up to 42 in. wide	.08
Cloth prints from negatives over 42 in. wide	.10

Minimum charge, 20c each print.

NEGATIVE PRINTING OR BROWN-LINE POSITIVE PRINTING

Alco Solar Paper prints, negative or positive, up to 42 in. wide	$0.06
Alco Solar Paper prints, negative or positive, over 42 in. wide	.10

Minimum charge, 25c each print.

Alco Solar Cloth prints, negative or positive, up to 42 in. wide	.10
Alco Solar Cloth prints, negative or positive, over 42 in. wide	.13

Minimum charge, 25c each print.

For prevailing prices see latest supplementary price list.

PHOTO PRINT SERVICE

Photostat reproductions of every description. Maps, blue prints, legal papers, financial statements, manifests and all written or printed documents can be quickly and economically copied by this process in any quantities. Prices vary according to size and quantities required and are cheerfully quoted on application. Samples of work sent on request.

LITHO PRINT PROCESS

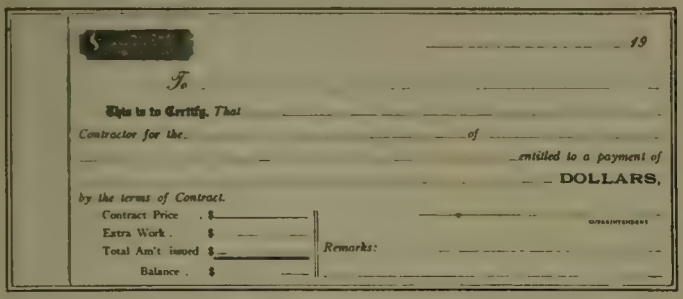
A comparatively recent process by which tracings, either pencil or ink, can be printed upon tracing cloth, linaura cloth or papers of any desired thickness. It offers unlimited possibilities as can be appreciated from the fact that a tracing cloth copy can be made from a tracing, and from which in turn blue prints or negatives can be made if required. Architects find it most appropriate for duplicating their ink or pencil tracings upon beavier papers since rendering is beautifully effected in so doing. It being a DRY PROCESS all shrinkage is overcome. It can be appreciated that this is important in certain classes of work since the shrinkage in blue printing is well understood and under the negative and blue-line processes is doubled.

Prices vary according to size and quantities, but compare very favorably with the charges as made for negative and blue-line work, and we therefore urge our friends to a consideration of the LITHO PROCESS when requiring copies of their tracings. Write us for quotations.

MOUNTING SERVICE

Patronage solicited for map mounting in all forms, continuous rolls, sheets, cut to fold for pocket use, etc. We have facilities for mounting extra large sheets, joining them perfectly, and can furnish double mounted sheets (muslin between) for platbook or record use. Inquiries will receive prompt attention.

SPECIFICATION AND AGREEMENT FORMS



No. 1330

No. 1330 Architects' Certificate Books, book of 100 with stubs..... $0.40

BLANK FORMS

No. 1332 Standard Blank Form Specifications, consisting of the following 14 forms in strong manilla cover:

Preamble
Masons, Cut Stone
Plasterers
Carpenters
Painters, Glaziers
Plumbers, Gas Fitters, Sewers
Galvanized Iron,
Iron (Structural)
Heating, Steam or Hot Water
Heating, Furnace
Electric Wiring
Agreement between Owner and Contractor (with Bond)
Contractor's Statement
Architect's Reminder (on inside of cover)

Per 100 sets....$17.50 Per dozen sets....$2.50 Each set....$0.25

STANDARD DOCUMENTS

A series of new contract documents, replacing the old uniform contracts which have been discontinued. These forms have been approved by the directors of the American Institute of Architects and National Association of Builders' Exchanges.

	Per 100	Each
No. 1335A Agreement and General Conditions.....	$9.50	$0.10
No. 1335B General Conditions without Agreement.....	7.60	.08
No. 1335C Bond of Suretyship	1.90	.02
No. 1335D Form of Subcontract	1.90	.02
No. 1335E Letter of Acceptance of Subcontractor's Proposal.	.95	.01
No. 1336 Set, complete, Nos. 1335A-1335E, in heavy paper cover with explanatory notes.....	14.25	.15

For prevailing prices see latest supplementary price list.

DRAWING INSTRUMENTS

FACTS TO BE CONSIDERED IN SELECTING

Before describing the qualities of the various grades of Drawing Instruments about to be presented, we feel that a few **remarks on the selection of instruments** are not amiss. This for the guidance of our friends residing away from the larger cities (where examination of the goods is impossible) and for the layman or student, inexperienced in the use of Drawing Instruments.

We hope, by this, to create a better understanding as to the different classes of instruments and their respective qualities and the purposes for which each line is primarily intended.

The **varieties** and qualities of Drawing Instruments are now so numerous and the finish, in all, so very similar (even though the intrinsic values are far greater in one than in another), that we have found it difficult for most anyone to grasp the actual and the comparative values of an instrument.

The **quality** can be determined only by their efficiency and durability in actual use and for this reason the advice of an instructor of drawing or that of an experienced draftsman is often sought by the beginner when considering the purchase of drawing tools.

Few people, however, have the good fortune to be thus guided and are compelled to rely solely upon the reputation of the dealer. We solicit consultation, either by personal visit or through correspondence, giving the assurance to our patrons of an honest representation of the merits of the goods under consideration. The A. Lietz Co., with its long established business career and reputation for honest dealings, will positively insure against misrepresentation.

The life and the efficiency of Drawing Instruments depends entirely upon the qualities of the materials or metals employed in their manufacture and **not on the finish;** upon careful and conscientious workmanship and on their design and general form.

Drawing Instruments recognized as of the highest quality are made of finest hard rolled German silver and best English steel and are not cast or coined in die. The employment of hard rolled plate metal naturally adds to the cost of making but it is absolutely necessary in the production of durable instruments; and being so made, they will outlast the actual need of professional draftsmen; in fact, have been known to be in use through successive generations.

DESCRIPTION OF VARIOUS QUALITIES

~~ALCO~~ SUPERIOR KERN SWISS DRAWING INSTRUMENTS

By reason of the great care in the selection of the materials and the attention given to the perfection in all the details of their manufacture, **Kern Swiss Drawing Instruments** have during the last century become recognized as the world's standard and highest quality.

DRAWING INSTRUMENTS

It is a singular fact that this little nation of people have produced for years absolute perfection in many lines of precisional instruments. We need mention only such articles as Planimeters, Integrators, Suspending Pantographs, Protractors, Chronometers, Watches, etc., to make our reader appreciate the abilities of the Swiss manufacturer to produce Drawing Instruments of exceptional qualities and merit. We commend to the consideration of our patrons the products of the Kern & Co. factories, located in Switzerland, which manufacture especially for us our line of **ALCO Superior Kern Swiss Drawing Instruments,** which we fully guarantee as to quality and workmanship.

For the protection of our patrons against misrepresentation we stamp all genuine **ALCO Superior Kern Swiss Drawing Instruments** with the following trade mark: **ALCO**.

These instruments are made of the finest hard rolled German silver and best English steel (not cast or coined) and can be relied upon to outlast a lifetime with any reasonable care and attention.

In addition to our **ALCO Superior Kern Swiss Drawing Instruments,** we offer an extensive assortment of carefully chosen instruments of varying qualities and for special purposes. Our years of experience in handling and importing drawing instruments has placed us in a most favorable position to choose from the markets of America and Europe the very best that are offered and the highest qualities of these various makes are presented under our

ALCO "CIRCLE A" DRAWING INSTRUMENTS

The merits of these instruments are fully stated on pages 304 to 307.

ALCO "CIRCLE L" DRAWING INSTRUMENTS

We give our sincere assurance that the instruments presented under this brand are of high quality and finish. Each tool is conscientiously recommended and guaranteed. They are made of fine hard rolled German silver, wrought metal, and highest grade tool steel. The finish is the finest that skilled labor can produce.

ALCO "CIRCLE T" DRAWING INSTRUMENTS

This line is offered as of exceptionally good value. They are the product of the world's largest factories and are guaranteed to be perfectly assembled and nicely fitted.

ALCO "CIRCLE *Z*" DRAWING INSTRUMENTS

For the purposes of the student or one having only occasional need for drawing instruments, this line is admirably adapted, being fully guaranteed as to quality and workmanship.

ALCO "JUNIOR" AND ALCO "PREP" DRAWING INSTRUMENTS

We also offer a well chosen line of ordinary instruments for school use, where the life of the instrument is an after consideration. Splendid values at the prices.

~~ALCO~~ SUPERIOR KERN SWISS DRAWING INSTRUMENTS

Each instrument stamped with trade mark

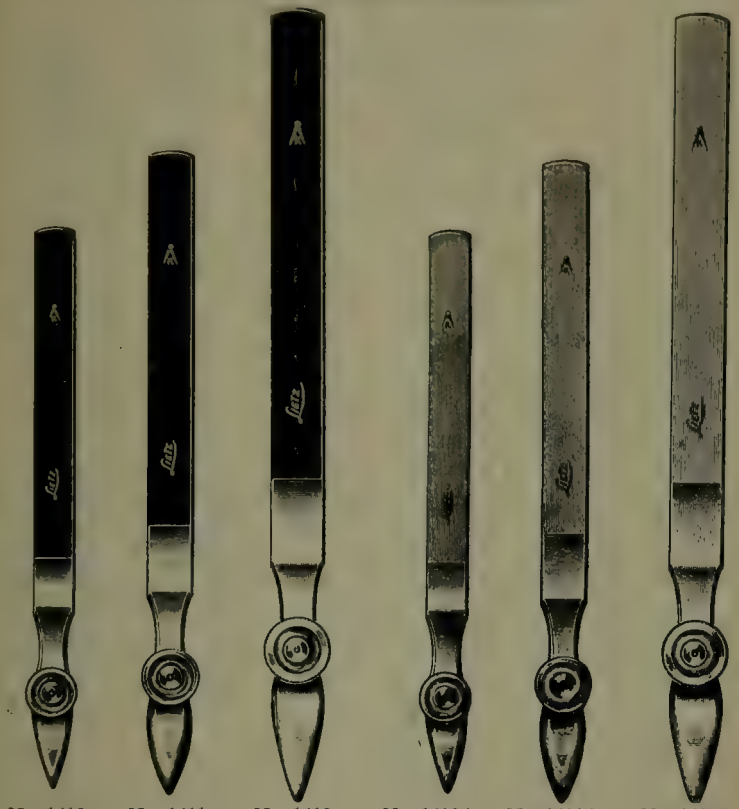
No. 1400A No. 1401A No. 1402A No. 1406A No. 1407A No. 1408A

No. 1400	Ruling Pen, 4½ in., upper blade with spring, ebony handle	$1.10
No. 1401	Ruling Pen, 5 in., upper blade with spring, ebony handle	1.20
No. 1402	Ruling Pen, 5½ in., upper blade with spring, ebony handle	1.35
No. 1400A	Ruling Pen, 4½ in., upper blade with spring, aluminum handle	1.20
No. 1401A	Ruling Pen, 5 in., upper blade with spring, aluminum handle	1.30
No. 1402A	Ruling Pen, 5½ in., upper blade with spring, aluminum handle	1.45
No. 1406	Ruling Pen, 4 in., with joint, ivory handle	1.40
No. 1407	Ruling Pen, 4¾ in., with joint, ivory handle	1.60
No. 1408	Ruling Pen, 5½ in., with joint, ivory handle	1.80
No. 1409	Ruling Pen, 6 in., with joint, ivory handle	2.00
No. 1406A	Ruling Pen, 4 in., with joint, aluminum handle	1.50
No. 1407A	Ruling Pen, 4¾ in., with joint, aluminum handle	1.70
No. 1408A	Ruling Pen, 5½ in., with joint, aluminum handle	1.90
No. 1409A	Ruling Pen, 6 in., with joint, aluminum handle	2.10

For prevailing prices see latest supplementary price list.

~~ALCO~~ SUPERIOR KERN SWISS DRAWING INSTRUMENTS

Each instrument stamped with trade mark.

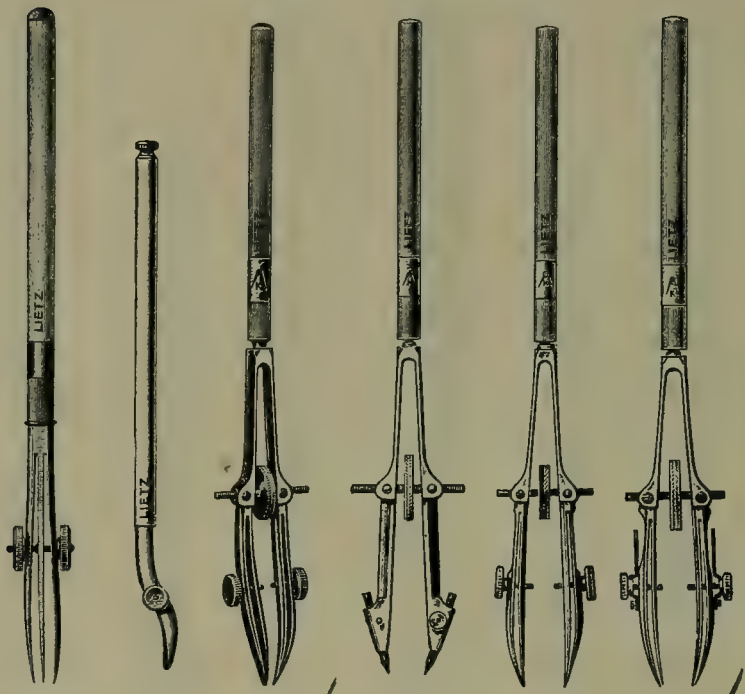


No. 1410 No. 1411 No. 1412 No. 1410A No. 1411A No. 1412A

No. 1410 Swedish Drawing Pen, 5 in., for broad lines, ebony handle	$1.60
No. 1411 Swedish Drawing Pen, 6 in., for broad lines, ebony handle	1.70
No. 1412 Swedish Drawing Pen, 7 in., for broad lines, ebony handle	1.80
No. 1410A Swedish Drawing Pen, 5 in., for broad lines, aluminum handle	1.70
No. 1411A Swedish Drawing Pen, 6 in., for broad lines, aluminum handle	1.80
No. 1412A Swedish Drawing Pen, 7 in., for broad lines, aluminum handle	1.90

~~ALCO~~ SUPERIOR KERN SWISS DRAWING INSTRUMENTS

Each instrument stamped with trade mark.



No. 1413 No. 1414 No. 1415 ✓ No. 1416 No. 1417 No. 1418 ✓

No. 1413	Border Pen for broad lines, ivory handle, 6 in.....	$3.00
No. 1413D	Border Pen (four blades) for broad lines or two parallel lines of equal or different thickness, ivory handle, 6 in.	3.50
No. 1414	*Curve Pen, German silver handle, 5 in.....	1.80
No. 1415	Swivel Railroad Pen, improved center adjustment, aluminum handle, 5½ in.	4.00
No. 1416	Railroad Pencil, improved center adjustment, aluminum handle, 5½ in.	3.25
No. 1417	Railroad Pen, improved center adjustment, aluminum handle, 5½ in.	3.25
No. 1418	Railroad Pen, same as No. 1417 but with quick opening device to facilitate cleaning, aluminum handle, 5½ in.....	3.50

*Pen No. 1414 is fastened to a rod which swivels in the hollow handle and thus follows the smallest curve with precision. The rod may be locked by means of a nut at the upper end, and the instrument may be used as an ordinary drawing pen.

For prevailing prices see latest supplementary price list.

~~ALCO~~ SUPERIOR KERN SWISS DRAWING INSTRUMENTS

Each instrument stamped with trade mark.

No. 1419 No. 1420 No. 1422 No. 1424 No. 1425 No. 1426

No. 1419	Railroad Pen, with joints to blades and in shanks, ivory handle, 5½ in.	$3.50
No. 1420	Railroad Pen, with joints to blades and in shanks, both pens bent in the same direction, ivory handle, 5½ in.	3.75
No. 1422	Dotting Pen, with 6 wheels and reservoir for ink, ivory handle, 6 in.	3.75
No. 1424	Pricker, ivory handle	1.10
No. 1425	Pricker, aluminum handle, disappearing needle point with cap	1.75
No. 1426	Tracer, aluminum handle	.90

For prevailing prices see latest supplementary price list.

~~ALCO~~ SUPERIOR KERN SWISS DRAWING INSTRUMENTS

Each instrument stamped with trade mark.

No. 1430

No. 1432

No. 1434

No. 1430 Minute Steel Spring Bow Dividers, German silver handle, 2½ in.	$2.00
No. 1432 Minute Steel Spring Bow Pen, German silver handle, 2½ in.	2.50
No. 1434 Minute Steel Spring Bow Pencil, German silver handle, 2½ in.	2.50
No. 1434C Set of three Steel Spring Bow Instruments, Nos. 1430, 1432 and 1434, in morocco case	8.20

No. 1440

No. 1442

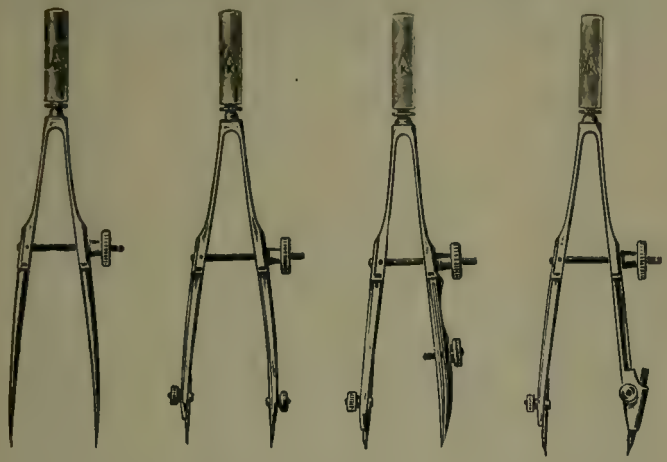
No. 1444

No. 1440 Steel Spring Bow Dividers, German silver handle, 3 in.	$2.00
No. 1442 Steel Spring Bow Pen, with needle point, German silver handle, 3 in.	2.50
No. 1444 Steel Spring Bow Pencil, with needle point, German silver handle, 3 in.	2.50
No. 1444C Set of three Steel Spring Bow Instruments, Nos. 1440, 1442 and 1444, in morocco case	8.20

For prevailing prices see latest supplementary price list.

~~ALCO~~ SUPERIOR KERN SWISS DRAWING INSTRUMENTS

Each instrument stamped with trade mark.



No. 1450 No. 1451 No. 1452 No. 1454

No. 1450 Steel Spring Bow Dividers with plain steel points, German silver handles, 4 in. $2.00

No. 1451 Steel Spring Bow Dividers with needle points, German silver handle, 4 in. 2.50

No. 1452 Steel Spring Bow Pen with needle point, German silver handle, 4 in. 2.50

No. 1454 Steel Spring Bow Pencil with needle point, German silver handle, 4 in. 2.50

No. 1454C Set of three Steel Spring Bow Instruments, Nos. 1450, 1452 and 1454, in Morocco case 8.20

No. 1457

No. 1456 Steel Spring Bow Dividers with plain steel points, ivory handle, 4¾ in. $2.00

No. 1457 Steel Spring Bow Pen with needle point, ivory handle, 4¾ in. 2.50

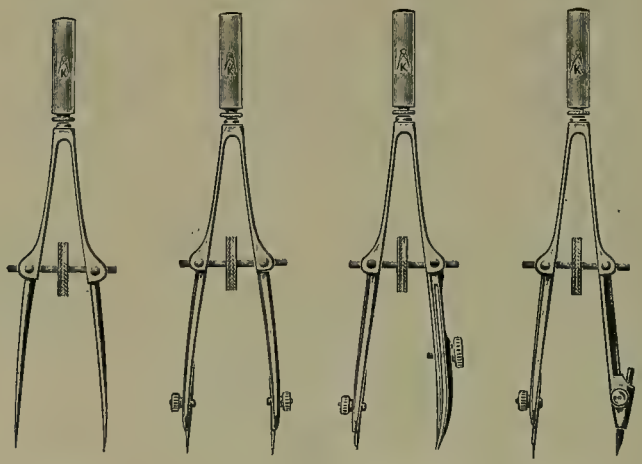
No. 1458 Steel Spring Bow Pencil with needle point, ivory handle, 4¾ in. 2.50

No. 1458C Set of three Steel Spring Bow Instruments, Nos. 1456, 1457 and 1458, in Morocco case 8.20

For prevailing prices see latest supplementary price list.

~~ALCO~~ SUPERIOR KERN SWISS DRAWING INSTRUMENTS

Each instrument stamped with trade mark.



No. 1460 No. 1461 No. 1462 No. 1464

No. 1460 Steel Spring Bow Dividers with plain steel points, German silver handle, 4 in.	$2.60
No. 1461 Steel Spring Bow Dividers with needle points, German silver handle, 4 in.	3.25
No. 1462 Steel Spring Bow Pen with needle point, German silver handle, 4 in.	3.25
No. 1464 Steel Spring Bow Pencil with needle point, German silver handle, 4 in.	3.25
No. 1464C Set of three Steel Spring Bow Instruments, Nos. 1460, 1462 and 1464, in Morocco case	10.35

For prevailing prices see latest supplementary price list.

~~ALCO~~ SUPERIOR KERN SWISS DRAWING INSTRUMENTS

Each instrument stamped with trade mark.

No. 1465

No. 1466

No. 1467

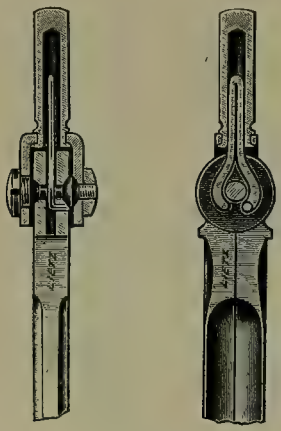
No. 1465 Combination Steel Spring Bow Instrument, with interchangeable pen, pencil and divider parts, German silver handle, 4 in.	$5.00
No. 1465C, same as No. 1465, in velvet lined case	5.75
No. 1466 Rotating Drop Bow Instrument, self-adjusting, for very small circles, 4¾ in.	3.75
No. 1466C, same as No. 1466, in velvet lined case	4.50
No. 1467 Rotating Drop Bow Instrument, like No. 1466 but with pencil part	5.00
No. 1467C, same as No. 1467, in velvet lined case	5.75

For prevailing prices see latest supplementary price list.

AMERICAN PATTERN

~~ALCO~~ SUPERIOR KERN SWISS DRAWING INSTRUMENTS

Each instrument stamped with trade mark.



The Kern Patent Pivot Joint Head offers the great advantage over all other types of construction in that it entirely suppresses any lost motion or injurious friction and that the stability of the head of the compass is greatly increased. We carry all Kern Dividers and Compasses with straightening device which admits of maintaining the handle in a perpendicular position at all times.

Original Pattern Compasses have the one leg made in one length. The needle is kept in a sheath and clamped by a set screw between the split end of that leg. Thus the needle may be put in any desired angle to it, i. e., perpendicular to the paper, permitting use of the entire length of leg and giving the compasses the widest possible range.

The other leg taking the points is jointed instead of the needle pencil or pen pieces having their joint.

The points are fastened in a very solid way and the needle in its holder or sheath is as steady as if in one piece with the leg.

AMERICAN PATTERN

~~ALCO~~ SUPERIOR KERN SWISS DRAWING INSTRUMENTS

Each instrument stamped with trade mark.

No. 1470-1 No. 1470-2 No. 1471 1472½ No. 1474¾

No. 1470-1	Plain Divider, 4½ in.	$2.25
No. 1470-2	Plain Divider, 5¾ in.	2.50
No. 1471	Hairspring Divider, 5¾ in.	3.50
No. 1472½	Compass, 4½ in., with fixed needle point, pen and pencil parts	6.00
No. 1474¾	Compass, 6 in., with fixed needle point, pen and pencil parts and lengthening bar	7.25
No. 1474¾H	Compass, 6 in., hairspring with fixed needle point, pen and pencil parts and lengthening bar	8.25

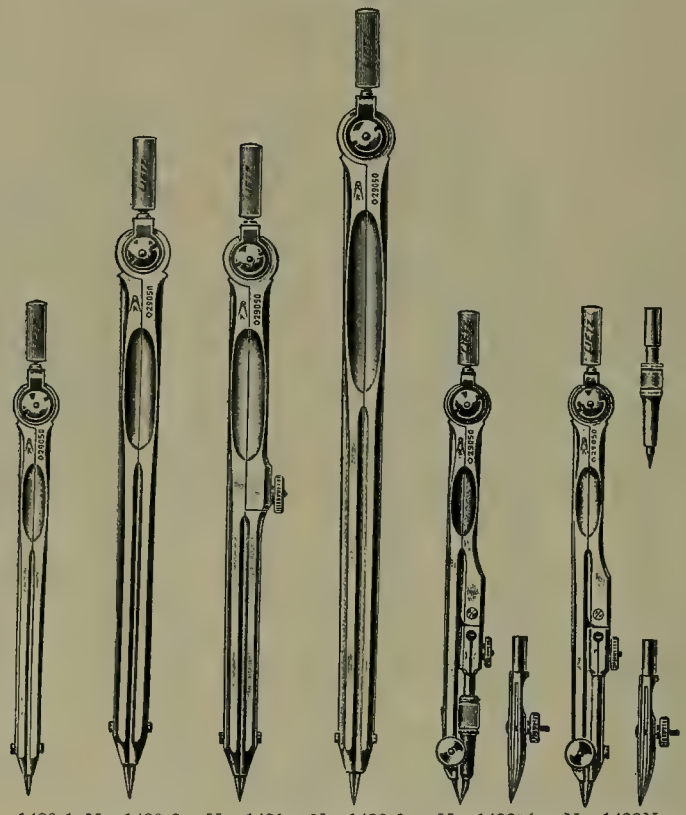
All Dividers and Compasses equipped with straightening device.

For prevailing prices see latest supplementary price list.

ORIGINAL PATTERN

~~ALCO~~ SUPERIOR KERN SWISS DRAWING INSTRUMENTS

Each instrument stamped with trade mark.



No. 1480-1 No. 1480-2 No. 1481 No. 1480-3 No. 1482½ No. 1482N

No. 1480-1	Plain Divider, 4½ in.	$2.25
No. 1480-2	Plain Divider, 5¾ in.	2.50
No. 1480-3	Plain Divider, 7 in.	3.00
No. 1481	Hairspring Divider, 5¾ in.	3.50
No. 1482½	Compass, 4½ in., with fixed needle point, pen and pencil parts	6.00
No. 1482N	Compass, 4½ in., same as No. 1482 but also with divider part	7.00

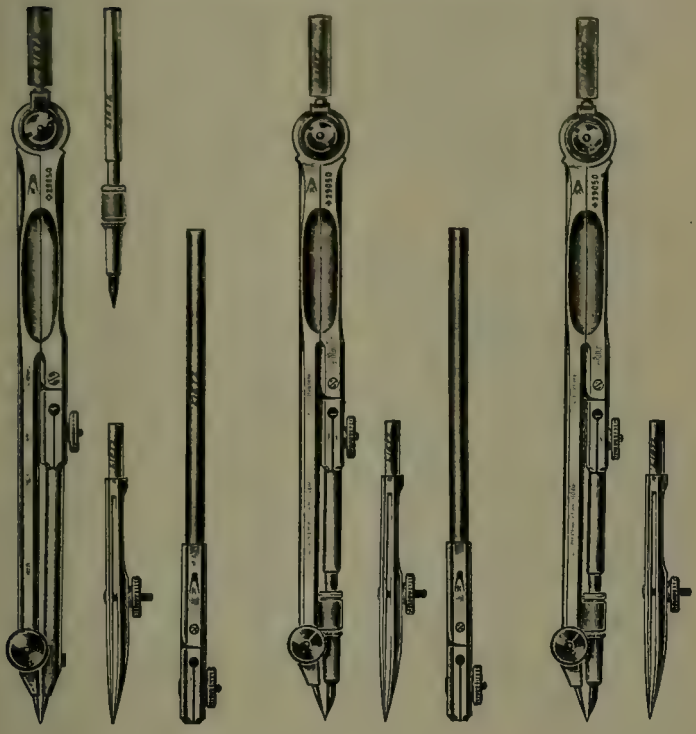
All Dividers and Compasses equipped with straightening device.

For prevailing prices see latest supplementary price list.

ORIGINAL PATTERN

~~ALCO~~ SUPERIOR KERN SWISS DRAWING INSTRUMENTS

Each instrument stamped with trade mark.



No. 1484 No. 1484¾ No. 1484½

No. 1484	Compass, 6 in., with fixed needle point, Divider, Pen and Pencil parts and Lengthening bar	$8.50
No. 1484H	Compass, 6 in., same as No. 1484 but with hairspring	9.50
No. 1484¾	Compass, 6 in., same as No. 1484 but without Divider point	7.25
No. 1484½	Compass, 6 in., same as No. 1484 but omitting Divider point and Lengthening bar	6.00
No. 1484-3	Compass, 7¼ in., same as No. 1484 but larger	9.25

All Compasses equipped with straightening device.

For prevailing prices see latest supplementary price list.

~~ALCO~~ SUPERIOR KERN SWISS DRAWING INSTRUMENTS

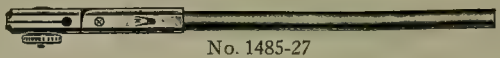
Extra Parts

No. 1485-5

No. 1485-5 Metal handle, containing needles, suitable for needle points, pen or pencil parts of small size compasses Nos. 1482, etc., permitting their use as ordinary prickers, ruling pens or pencils $0.50
6 Metal handle, containing needles, same as No. 1485E but for parts of large compasses, No. 1484, etc. ..... .60
8 Ebony handle for Ruling Pens ..... .15
9 Aluminum handles for Ruling Pens ..... .25
10 Ivory handles for Ruling Pens ..... .20
11 German silver handles for Bow Instruments ..... .25
12 Ivory handle for Bow Instruments ..... .25
13 Screws or bolt and nut for pens ..... .35
14 Bolts for side motion Bow Instruments ..... .35
15 Center motion screw with left and right thread ..... .40

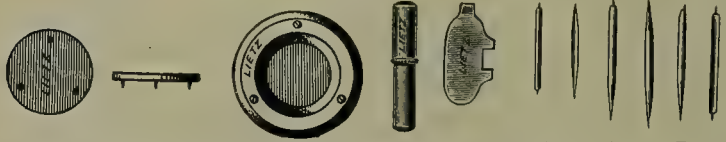
16 17 18 19 20 21 22 23 24 25

No. 1485-16 Divider or Needle point part for Nos. 1465, 1467, etc $1.25
17 Pencil part for Nos. 1465, 1467, etc 1.25
18 Pen part for Nos. 1465, 1467, etc 1.25
19 Pencil part for Nos. 1465, 1467, etc 1.25
20 Divider or Needle point part for No. 1482, etc 1.35
21 Pencil part for No. 1482, etc 1.35
22 Pen part for No. 1482, etc 1.35
23 Divider or Needle point part for No. 1484, etc 1.50
24 Pencil part for No. 1484, etc 1.50
25 Pen part for No. 1484, etc 1.50



No. 1485-27

26 Lengthening bar for 4½-inch Compasses $1.25
27 Lengthening bar for 6½-inch Compasses 1.50



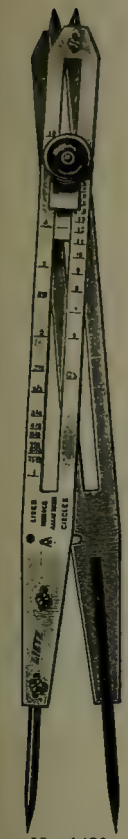
1486 1486R 1487 1488 1489-A B C D E F

No. 1486 Horn Center ¼-inch diameter, plain, for resting compass or divider over given point $0.10
No. 1486R Horn Center ¼-inch diameter, with German silver rim ..... .50
No. 1487A German silver box containing leads for instruments ..... .25
No. 1487B Tin box containing three leads for instruments ..... .10
No. 1488 Extra key for joints of Kern instruments ..... .10
No. 1489 Extra needle points for instruments (order by letter) ..... .15

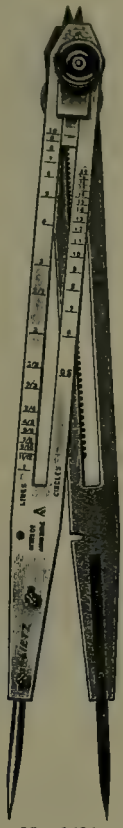
 For empty cases for instruments see Page 361

~~ALCO~~ SUPERIOR KERN SWISS DRAWING INSTRUMENTS

Each instrument stamped with trade mark.



No. 1490



No. 1491

Nos. 1492-1493

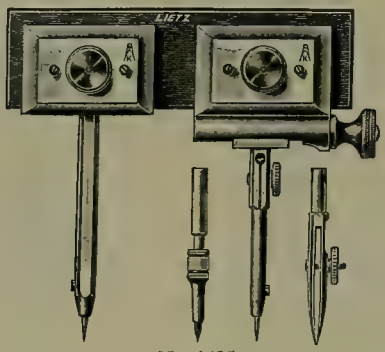
No. 1496	Proportional Dividers, 8 in., with movable points, finely divided for lines and circles	$10.00
No. 1491	Proportional Dividers, 8 in., with moveable points, rack movement, finely divided for lines and circles	12.50
No. 1492	Proportional Dividers, 8 in., with movable points, micrometer adjustment finely divided for lines and circles	12.50
No. 1493	Proportional Dividers, 8 in., with movable points, micrometer adjustment, finely divided for lines, circles, planes and solids	16.00
No. 1490C	Cases, velvet lined, with bar lock for Proportional Dividers Nos. 1490-1493	1.00

For other Proportional Dividers see pages 333 and 364.

For prevailing prices see latest supplementary price list.

~~ALCO~~ SUPERIOR KERN SWISS DRAWING INSTRUMENTS

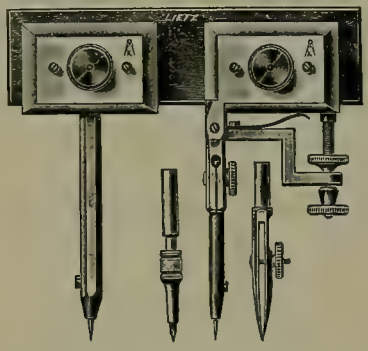
Each instrument stamped with trade mark.



No. 1495

No. 1495 Beam Compass with two steel points, pen and pencil parts, lateral micrometer adjustment $8.00

No. 1495C, same as No. 1495 in velvet lined case 10.25



No. 1496

No. 1496 Beam Compass with two steel points, pen and pencil parts, vertical micrometer adjustment $9.00

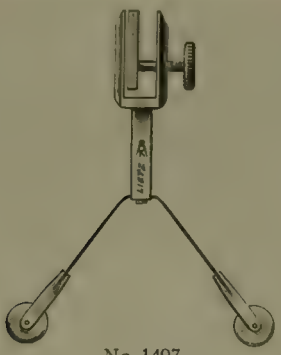
No. 1496C, same as No. 1496 in velvet lined case 11.25

For other Beam Compasses see pages 334 to 337 and 368.

For prevailing prices see latest supplementary price list.

~~ALCO~~ SUPERIOR KERN SWISS DRAWING INSTRUMENTS

Each instrument stamped with trade mark.



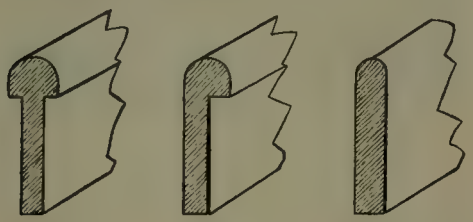
No. 1497

No. 1497 Wheel attachment or balance for Beam Compasses Nos. 1495 and 1496 ..... $2.25

No. 1497C Case only, velvet lined, to contain Beam Compass No. 1495 and attachment No. 1497 ..... 2.50

No. 1498C Case only, velvet lined, to contain Beam Compass No. 1496 and attachment No. 1497 ..... 2.50

BARS FOR BEAM COMPASSES



No. 1499A No. 1499B No. 1499C

Inches—	24	30	36	42	48	60
No. 1499A Hardwood. Each	$0.35	$0.40	$0.45	$0.55	$0.65	$0.75
No. 1499B Hardwood. Each	.30	.35	.40	.45	.50	.65
No. 1499C Hardwood. Each	.20	.25	.30	.35	.40	.50

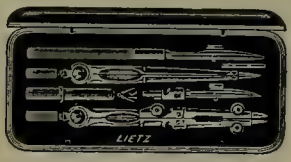
If possible please state for which instrument beam is intended.

For prevailing prices see latest supplementary price list.

AMERICAN PATTERN

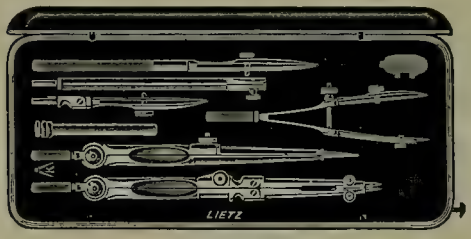
~~ALCO~~ SUPERIOR KERN SWISS DRAWING INSTRUMENTS

In Finest Morocco Pocket Cases
Each instrument stamped with trade mark



No. 1500BL

No. 1500BL Bar Lock Case, silk lined, containing:
No. 1400 Ruling Pen, 4½ in.....
No. 1470-1 Plain Divider, 4½ in.....
No. 1472 Compasses, 4½ in., with fixed needle point, pen and pencil parts and key.....
No. 1487A Box containing leads.....
Per set $12.50



No. 1502PB
(Illustration of a Bar Lock Case)

No. 1502PB Pocket Book Case with folding flaps, silk lined, containing:
No. 1401 Ruling Pen, 5 in.....
No. 1452 Spring Bow Pen, 4 in.....
No. 1471 Hairspring Divider, 5¾ in.....
No. 1474¾ Compasses, 6 in., with fixed needle point, pen and pencil parts and lengthening bar and key.....
No. 1487A Box containing leads .....
Per set $18.00

All Dividers and Compasses equipped with straightening device.

For prevailing prices see latest supplementary price list.

AMERICAN PATTERN
~~ALCO~~ SUPERIOR KERN SWISS DRAWING INSTRUMENTS

In Finest Morocco Pocket Cases
Each instrument stamped with trade mark.

No. 1504PB

Sets with Side Bow Instruments

No. 1504BL Bar Lock Case, silk lined, containing:
- No. 1400 Drawing Pen, 4½ in., upper blade with spring, ebony handle
- No. 1401 Drawing Pen, 5 in., upper blade with spring, ebony handle
- No. 1451 Steel Spring Bow Divider, 4 in., metal handle
- No. 1452 Steel Spring Bow Pen, 4 in., metal handle
- No. 1454 Steel Spring Bow Pencil, 4 in., metal handle
- No. 1471 Hairspring Divider, 5¾ in., steel points
- No. 1474A Compass, 6 in., with fixed needle point, pen and pencil parts and lengthening bar and key
- No. 1487 Box containing Leads

Per set $23.50

No. 1504PB, same as No. 1504BL but in Pocket Book Case with folding flaps, chamois lined. Per set 23.50

No. 1504BLH, same as No. 1504BL but with Hairspring Compass No. 1474¾H in lieu of Compass No. 1474¾ 24.75

No. 1504PBH, same as No. 1504PB but with Hairspring Compass No. 1474¾H in lieu of Compass No. 1474¾ 24.75

Sets with Center Wheel Bow Instruments and Hairspring Compasses

No. 1505BL, same as No. 1504BL but with Center Motion Bow Instruments Nos. 1461, 1462, 1464 in lieu of Nos. 1451, 1452, 1454 ..... $25.75

No. 1505PB, same as No. 1504PB but with Center Motion Bow Instruments Nos. 1461, 1462, 1464 in lieu of Nos. 1451, 1452, 1454 ..... 25.75

No. 1506BLH, same as No. 1505BL but with Hairspring Compass No. 1474¾H in lieu of Compass No. 1474¾ 27.00

No. 1505PBH, same as No. 1505PB but with Hairspring Compass No. 1474¾H in lieu of Compass No. 1474¾ 27.00

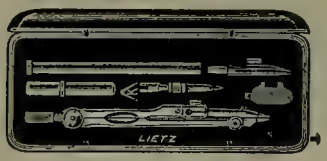
All Dividers and Compasses equipped with straightening device.

ORIGINAL PATTERN

~~ALCO~~ SUPERIOR KERN SWISS DRAWING INSTRUMENTS

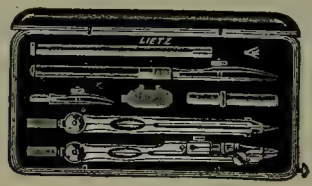
In Finest Morocco Pocket Cases

Each instrument stamped with trade mark.



No. 1509BL

No. 1509BL Bar Lock Case, silk lined, containing:
No. 1482N Compass, 4½ in., with fixed needle point, divider point, pen and pencil parts and key.....
No. 1485-13 Small handle containing needles for pen and pencil parts .....
No. 1487A Box containing Leads.....
Per set $10.00



No. 1510BL

No. 1510BL Bar Lock Case, silk lined, containing:
No. 1400 Ruling Pen, 4½ in. .....
No. 1480-1 Plain Divider, 4½ in. .....
No. 1482 Compass, 4½ in., with fixed needle point, pen and pencil parts and key.....
No. 1485-13 Handle containing needles for pen and pencil parts .....
No. 1487A Box containing Leads .....
Per set $12.50

All Dividers and Compasses equipped with straightening device.

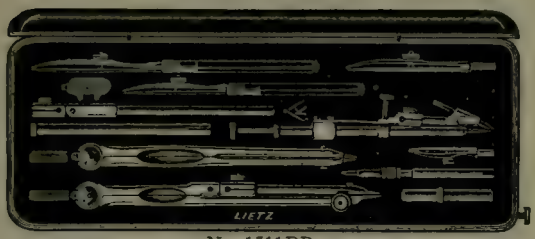
For prevailing prices see latest supplementary price list.

ORIGINAL PATTERN

~~ALCO~~ SUPERIOR KERN SWISS DRAWING INSTRUMENTS

In Finest Morocco Pocket Cases

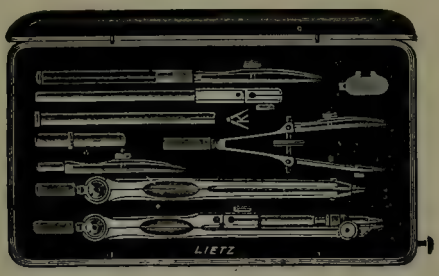
Each instrument stamped with trade mark.



No. 1511PB
(Illustration of a Bar Lock Case)

No. 1511PB Pocket Book Case with folding flaps, chamois lined, containing:

No. 1400 Ruling Pen, 4½ in.
No. 1401 Ruling Pen, 5 in.
No. 1467 Rotating Drop Bow Instrument with pen and pencil parts.
No. 1480-2 Plain Divider, 5¾ in.
No. 1484¾ Compass, 6 in., with needle point, divider point, pen and pencil parts and lengthening bar and key.
No. 1485-13B Handle (containing needles) for parts of No. 1484.
No. 1487A Box containing Leads
Per set $21.00



No. 1512PB
(Illustration of a Bar Lock Case)

No. 1512PB Pocket Book Case with folding flaps, chamois lined, containing:

No. 1401 Ruling Pen, 5 in.
No. 1462 Steel Spring Bow Pen, 4 in., center motion.
No. 1480-2 Plain Divider, 5¾ in.
No. 1484¾ Compass, 6 in., with fixed needle point, pen and pencil parts and lengthening bar and key.
No. 1485-13B Handle (containing needles) for parts of No. 1484¾.
No. 1487A Box containing Leads
Per set $18.00

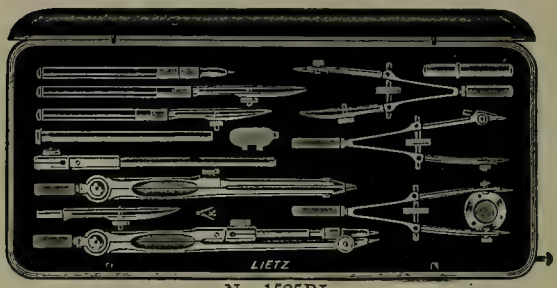
All Dividers and Compasses equipped with straightening device.

ORIGINAL PATTERN

~~ALCO~~ SUPERIOR KERN SWISS DRAWING INSTRUMENTS

In Finest Morocco Cases

Each instrument stamped with trade mark.



No. 1525BL

Sets with Side Motion Bows

No. 1524BL Bar Lock Case, chamois lined, containing:
- No. 1400 Ruling Pen, 4½ in. .....
- No. 1401 Ruling Pen, 5 in. .....
- No. 1425 Pricker, 5 in. .....
- No. 1451 Steel Spring Bow Divider, 4 in., with needle points
- No. 1452 Steel Spring Bow Pen, 4 in., with needle points..
- No. 1454 Steel Spring Bow Pencil, 4 in., with needle points
- No. 1481 Hairspring Divider, 5¾ in. .....
- No. 1484¾ Compass, 6 in., with fixed needle point, pen and pencil parts, lengthening bar and key.....
- No. 1485-13B Handle (containing needles) for parts of No. 1484¾ .....
- No. 1486R Horn Center with metal rim .....
- No. 1487A Box containing Leads. Per set $26.50

No. 1524PB, same as No. 1524BL but in Pocket Book Case with folding flaps, chamois lined. Per set 26.50

Sets with Side Motion Bows and Hairspring Compass

No. 1424BLH, same as No. 1524BL but with Hairspring Compass No. 1484¾H in lieu of No. 1484¾. Per set..... 27.50

No. 1524PBH, same as No. 1524BLH but in Pocket Book Case with folding flaps, chamois lined. Per set..... 27.50

Sets with Center Motion Bow Instruments

No. 1525BL, same as No. 1524BL but with Center Motion Bow Instruments Nos. 1461, 1462, 1464 in lieu of Nos. 1451, 1452, 1454. Per set 28.75

No. 1525PB, same as No. 1525BL but in Pocket Book Case with folding flaps, chamois lined. Per set 28.75

Sets with Center Motion Bows and Hairspring Compass

No. 1525BLH, same as No. 1525BL but with Hairspring Compass No. 1484¾H in lieu of Compasses No. 1484¾. Per set.... 29.75

No. 1525PBH, same as No. 1525BLH but with Hairspring Compass folding flaps, chamois lined. Per set..... 29.75

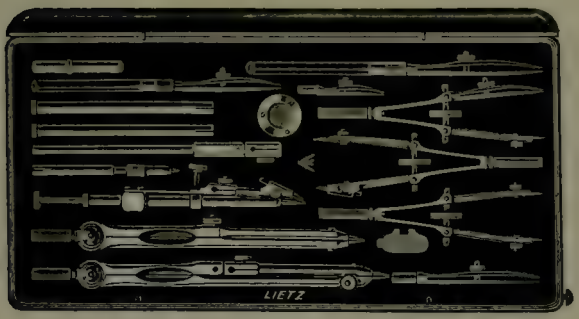
All Dividers and Compasses equipped with straightening device.

ORIGINAL PATTERN

~~ALCO~~ SUPERIOR KERN SWISS DRAWING INSTRUMENTS

In Finest Morocco Cases

Each instrument stamped with trade mark.



No. 1526BL

Illustration shows Compass without Hairspring.

Sets with Rotating Drop Bow Instruments

No. 1526BLH, same assortment as No. 1525BLH but with (in addition) No. 1467 Rotating Drop Bow Instrument with pen and pencil parts .....
No. 1485-13 Small Handle (containing needles) for parts of No. 1467 .....
Per set $35.00

No. 1526PBH, same as No. 1526BLH but in Pocket Book Case with folding flaps, chamois lined. Per set..... 35.00

Sets with Detail Pen, Contour Pen and Railroad Pen

No. 1527BLH, same as assortment No. 1525BLH but with (in addition):
No. 1411A Swedish Detail Pen, 6 in., with aluminum handle
No. 1414 Curved Pen, 5 in., German Silver handle.....
No. 1415 Swivel Railroad Pen, 5½ in., German silver handle
Per set $37.50

No. 1527PBH, same as No. 1527BLH but in Pocket Book Case with folding flaps, chamois lined. Per set..... 37.50

All Dividers and Compasses equipped with straightening device.

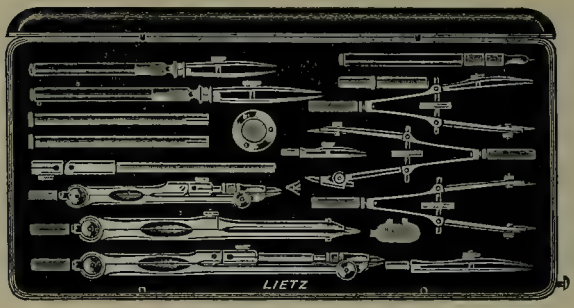
For prevailing prices see latest supplementary price list.

ORIGINAL PATTERN

~~ALCO~~ SUPERIOR KERN SWISS DRAWING INSTRUMENTS

In Finest Morocco Cases

Each instrument stamped with trade mark.



No. 1528PB

No. 1528BL Bar Lock Case, chamois lined, containing:
- No. 1407A Ruling Pen, 4½ in.....
- No. 1408A Ruling Pen, 5 in.....
- No. 1425 Pricker .....
- No. 1461 Spring Bow Divider, 4 in., center motion.....
- No. 1462 Spring Bow Pen, 4 in., center motion.....
- No. 1464 Spring Bow Pencil, 4 in., center motion .....
- No. 1481 Hairspring Divider, 5¾ in.....
- No. 1482½ Compass, 4½ in., with fixed needle point, pen and pencil parts and key.....
- No. 1484¾ Compass, 6 in., with fixed needle point, pen and pencil parts, lengthening bar and key.....
- No. 1485-13 Small Handle (containing needles) for parts of No. 1482 .....
- No. 1485-13B Large Handle (containing needles) for parts of No. 1484¾.....
- No. 1486M Horn Center with metal rim.....
- No. 1487A Box containing Leads.....

Per set $36.50

No. 1528PB, same as No. 1528BL but in Pocket Book Case with folding flaps, chamois lined. Per set..... 36.50

All Dividers and Compasses equipped with straightening device.

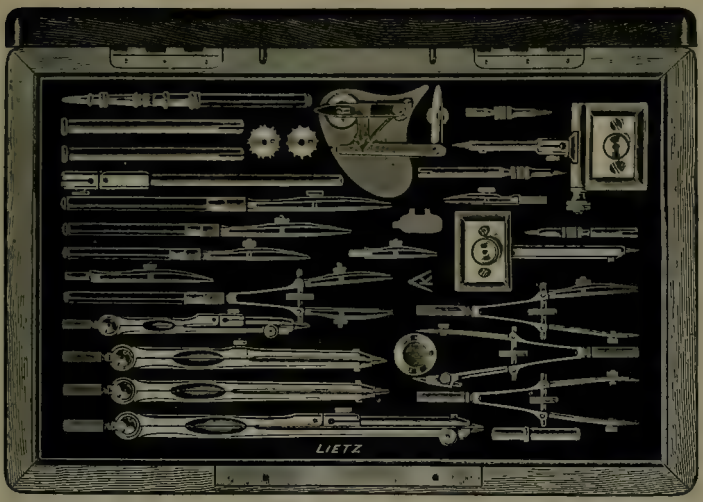
For prevailing prices see latest supplementary price list.

ORIGINAL PATTERN

~~ALCO~~ SUPERIOR KERN SWISS DRAWING INSTRUMENTS

In Polished Mahogany Case

Each instrument stamped with trade mark.



No. 1529

No. 1529 Fine Polished Mahogany Case with name plate, folding lid and tray, chamois lined with key, containing:

No. 1400 Ruling Pen, 4½ in., ebony handle.....
No. 1401 Ruling Pen, 5 in., ebony handle.....
No. 1402 Ruling Pen, 5½ in., ebony handle.....
No. 1415 Swivel Railroad Pen, 5½ in.....
No. 1425 Pricker, 5 in.....
No. 1461 Spring Bow Divider, 4 in., center motion.....
No. 1462 Spring Bow Pen, 4 in., center motion.....
No. 1464 Spring Bow Pencil, 4 in., center motion.....
No. 1480-2 Plain Divider, 5¾ in., best steel points.....
No. 1481 Hairspring Divider, 5¾ in., best steel points.....
No. 1482N Compass, 4½ in., with fixed needle point, divider point, pen and pencil parts and key.....
No. 1484-3 Compass, 7¼ in., with fixed needle point, divider point, pen and pencil parts, lengthening bar and key.....
No. 1495 Beam Compass with two steel divider points, pen and pencil parts .....
No. 1485-13 Small Handle (containing needles) for parts of No. 1482N
No. 1485-13B Large Handle (containing needles) for parts of No. 1484..
No. 1486M Horn Center with metal rim.....
No. 1487A Box containing Leads .....
Dotting instrument with interchangeable wheels.

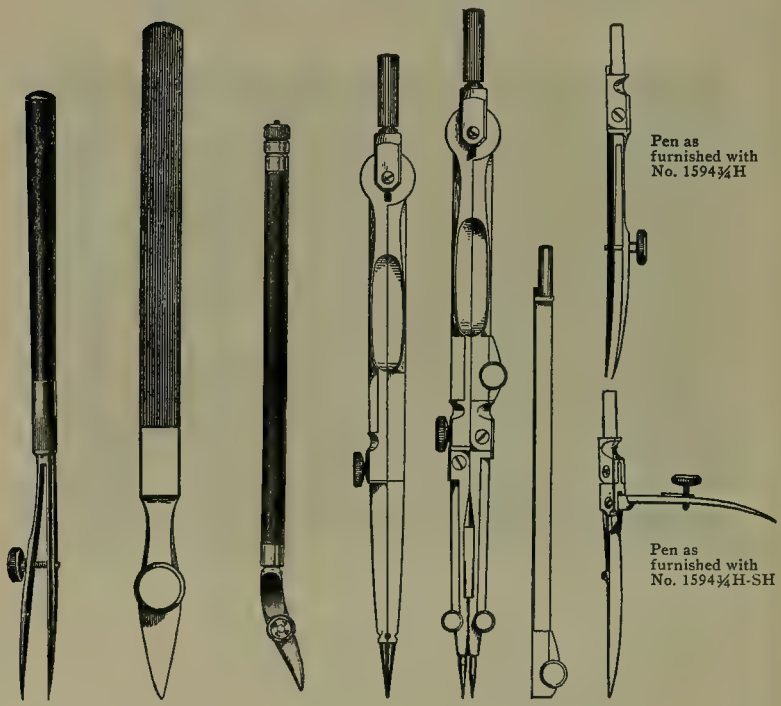
Per set $67.50

All Dividers and Compasses equipped with straightening device.

For prevailing prices see latest supplementary price list.

ALTENEDER'S DRAWING INSTRUMENTS

Each instrument is stamped T. A. or T. A. & Sons.



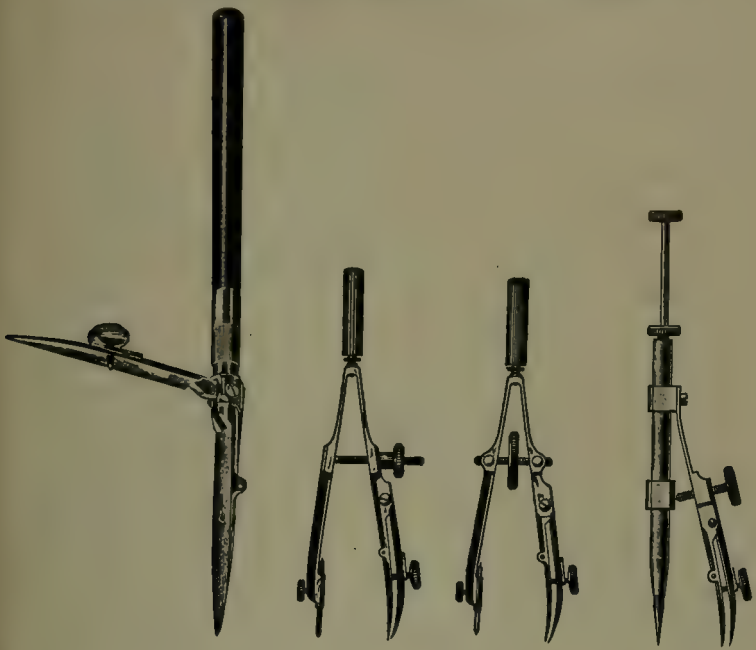
No. 1551 No. 1561 No. 1564 No. 1591 No. 1594¾H and No. 1594¾ H-SH

No. 1550 Ruling Pen, 4¼ in., upper blade with spring, ebony handle	$1.40
No. 1551 Ruling Pen, 5 in., upper blade with spring, ebony handle	1.65
No. 1552 Ruling Pen, 5½ in., upper blade with spring, ebony handle	1.90
No. 1550A Ruling Pen, 4¼ in., upper blade with spring, aluminum handle	1.40
No. 1551A Ruling Pen, 5 in., upper blade with spring, aluminum handle	1.65
No. 1552A Ruling Pen, 5½ in., upper blade with spring, aluminum handle	1.90
No. 1560 Swedish Ruling Pen, 5 in., ebony handle	1.75
No. 1561 Swedish Ruling Pen, 6 in., ebony handle	2.00
No. 1562 Swedish Ruling Pen, 7 in., ebony handle	2.25
No. 1560A Swedish Ruling Pen, 5 in., aluminum handle	2.25
No. 1561A Swedish Ruling Pen, 6 in., aluminum handle	2.50
No. 1562A Swedish Ruling Pen, 7 in., aluminum handle	2.75
No. 1564 Curve Pen, 4¾ in., hollow metal handle	2.00
No. 1591 Hairspring Divider, 5 in.	4.00
No. 1594¾H Compass, 5½ in., Hairspring, with fixed needle point (leg), pen and pencil parts and lengthening bar	9.00
No. 1594¾H-SH, same as No. 1594¾H but with Patent Spring Hinge Pen	10.25

For prevailing prices see latest supplementary price list.

ALTENEDER'S DRAWING INSTRUMENTS

Each instrument is stamped T. A. or T. A. & Sons.

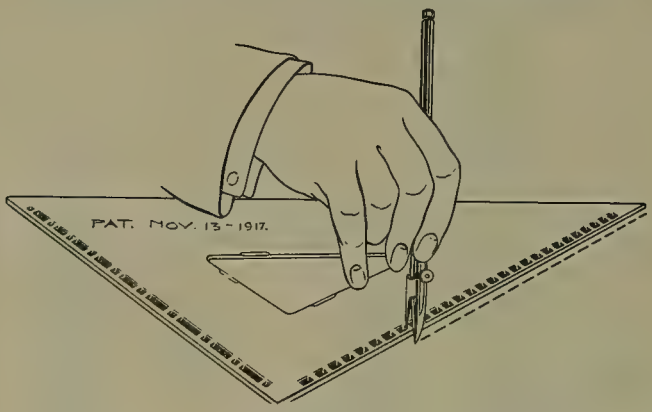


No. 1557 SH No. 1572 SH No. 1582 SH No. 1586 SH

No. 1556SH Spring Hinge Ruling Pen, 4¼ in., ebony handle	$2.90
No. 1557SH Spring Hinge Ruling Pen, 5 in., ebony handle	2.90
No. 1558SH Spring Hinge Ruling Pen, 5½ in., ebony handle	2.90
No. 1556A-SH Spring Hinge Ruling Pen, 4¼ in., aluminum handle	2.90
No. 1557A-SH Spring Hinge Ruling Pen, 5 in., aluminum handle	2.90
No. 1558A-SH Spring Hinge Ruling Pen, 5½ in., aluminum handle	2.90
No. 1570 Steel Spring Bow Divider with plain steel points, German silver handle, 3¼ in.	1.75
No. 1571 Steel Spring Bow Divider with needle points, German silver handle, 3¼ in.	2.50
No. 1572 Steel Spring Bow Pen, German silver handle, 3¼ in	2.65
No. 1572SH Steel Spring Bow Pen with spring hinge, German silver handle, 3¼ in.	4.00
No. 1574 Steel Spring Bow Pencil, German silver handle, 3¼ in	2.50
No. 1574C Morocco case for 3 Steel Spring Bow Instruments	1.25
No. 1580 Steel Spring Bow Divider, center motion, with plain steel points, German silver handle, 3¼ in	2.60
No. 1581 Steel Spring Bow Divider, center motion, with needle points, German silver handle, 3¼ in	3.25
No. 1582 Steel Spring Bow Pen, center motion, German silver handle, 3¼ in	3.40
No. 1582SH Steel Spring Bow Pen, center motion, with spring hinge, German silver handle, 3¼ in	4.75
No. 1584 Steel Spring Bow Pencil, center motion, German silver handle, 3¼ in	3.25
No. 1584C Morocco case for 3 Steel Spring Bow Instruments	1.25
No. 1586SH Rotating Drop Bow Pen with spring hinge, 4 in	5.50
No. 1587SH Rotating Drop Bow Instrument, like No. 1586SH but with pencil part	6.50
No. 1588C Morocco case for Rotating Drop Bow Instrument Nos. 1586SH or 1587SH	1.00

For prevailing prices see latest supplementary price list.

THE RAPID DOT AND DASH DEVICE



The Rapid Dot and Dash Device as applied to amber triangles or amber-lined T squares and straight edges is a simple and most practical one, consisting of an intermittent groove cut just in back of the edges.

A small metal attachment, which can be adjusted to either nib of any ordinary ruling pen, travels along these grooves, the uncut portions causing the pen to be lifted off the paper, registering the spaces between the dots and dashes, while the cut portions form the dots and dashes. This attachment, when once adjusted, requires no changing and does not interfere with the use of the pen for straight-line work, nor do the grooves in any way affect the edges of the triangles or straightedges.

We recommend this device as the most perfect and efficient dotting instrument yet devised. The results obtained are absolutely perfect and the variety of designs is unlimited. We are in a position to furnish any special design to order and offer the following suggestions, which we can furnish on a day's notice:

1
2
3
4
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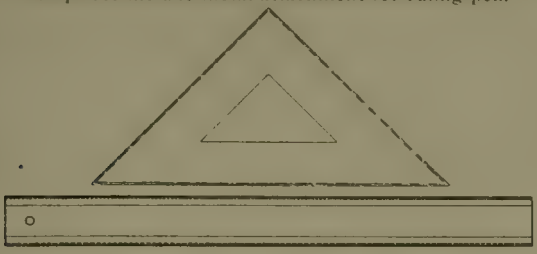
11
12
13

Price list on opposite page.

PRICE LIST OF RAPID DOT AND DASH DEVICES

All prices include metal attachment for ruling pen.



Amber Triangles, including choice of any **three designs,** cut-in edges as desired. (See instructions, "How to Order," at bottom of page.)

No. 1590—30°x60°—

6″	7″	8″	9″	10″	11″	12″	13″	14″	15″	16″	18″
$1.00	$1.20	$1.40	$1.60	$1.80	$2.00	$2.25	$2.70	$3.10	$3.65	$4.15	$5.20

No. 1591—22½°x67½°—Same prices as No. 1550.

No. 1592—45°—

5″	6″	7″	8″	9″	10″	11″	12″	13″	14″	15″	16″
$1.15	$1.35	$1.60	$1.85	$2.15	$2.45	$2.85	$3.25	$3.60	$4.10	$4.80	$5.35

Amber-lined Straightedges, including designs as selected, cut-in on **two edges.** (See instructions, "How to Order," at bottom of page.)

No. 1594—

15″	18″	24″	30″	36″	42″
$1.95	$2.30	$3.00	$3.75	$4.55	$5.40

Amber-lined Straightedges, including designs as selected, cut-in on **four edges.** (See instructions, "How to Order," at bottom of page.)

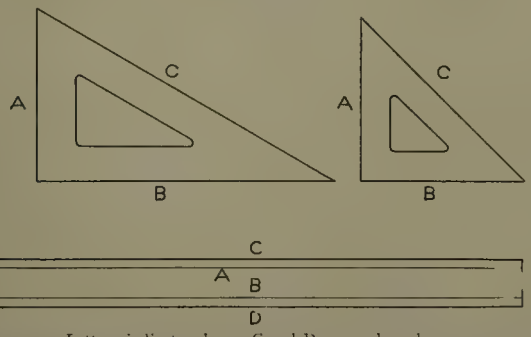
No 1596—

15″	18″	24″	30″	36″	42″
$3.15	$3.75	$5.00	$6.15	$7.40	$8.75

Designs can also be cut on Amber-lined T-squares or Splines (for drawing curved dotted lines). Our charge for cutting dotting designs is 4 cents per running inch on each edge, in addition to the price of the T-square or Spline.

Amber-lined T-squares listed on page 465. Amber Splines listed on page 454.

HOW TO ORDER



Letters indicate edges. C and D are under edges.

In order to better facilitate the ordering of Rapid Dot and Dash Devices, we submit the above sketch of triangles and straightedge, their respective edges marked with letters A, B, C, D. This will enable the ordering of a design on the particular edge best suited.

Example

Send me 1 Triangle No. 1592—12 in., edge A design 1, B-5, C-6..... $3.25
(The letters designate the edge and the numbers the design wanted.)

ALCO "CIRCLE A" DRAWING INSTRUMENTS

Each instrument stamped ~~ALCO~~ Ⓐ

The one point of great importance about ALCO "Circle A" Drawing Instruments is that they are all made to gauge, all parts being interchangeable. The materials used are very finest quality of rolled German silver and best steel.

COMPASSES AND DIVIDERS

The foremost requirement in Compasses and Dividers intended for high-class work is an absolutely true and steady joint. By reason of their construction the joints of our ALCO "Circle A" Compasses can never become loose or work unevenly; it permits of exact adjustment and may readily be oiled. The construction is shown in the accompanying illustrations. Fig. 1 shows the plain joint while Fig. 2 illustrates the joint in connection with our straightening device.

Fig. 1

Fig. 2

Fig. 3

The shanks of the Compasses which are centrically connected by a bipartite pivot showing a rounded head on either side, are enclosed by a fork carrying corresponding cavities on either side of its inner surface to receive the rounded heads of the pivots. The ends of the fork are drawn together by a screw passing between the legs of the compasses, by means of which the tension can be minutely regulated.

The shanks of the compasses are thus held together, not by the natural and therefore transient elasticity of the fork, but by the permanent pressure exerted by the screw. This construction warrants a true and smooth action at all times.

The straightening device forces the handle to remain in a central position to the legs. The construction will be clear by reference to Fig. 3.

ALCO "CIRCLE A" DRAWING INSTRUMENTS

Each instrument stamped ALCO Ⓐ

The manner by which pen, pencil and needle point parts are held in place in their socket is very simple, but at the same time effective, so that these parts can never get shaky (See Fig. 4). The socket is split and the two sides being draw together by a T-bolt screw clamp the inserted parts firmly in place.

Fig. 4

Fig. 5

All Compasses are supplied with needle point parts; these when inserted turn the instruments into perfect Dividers. One of the legs is provided with a needle point held in a split reversible sleeve (Fig. 5), so that either a plain or shouldered point may be used. The points can always be adjusted to a position perpendicular to the paper regardless of the opening and without any noticeable shortening of the leg, in this way avoiding sliding and misplacing of the center point and allowing the instrument to be used on a considerably larger radius than is possible with the old style Compasses, the lengthening bar being dispensable.

All needle points have extremely fine and sharp points allowing of accurate spacing and leaving only the slightest marks on the paper. They are not ordinary sewing needles but are specially made for the instruments from best hardened steel.

In all of the ALCO "Circle A" Drawing Instruments the steel points are removable. They are held in place by small clamp screws and can be exchanged very easily by giving the heads of the screws half a turn with the screwdriver. The troublesome regrinding of broken points is entirely done away with. If a point is worn or damaged it can be replaced by a new one. Reserve points are supplied with every set of instruments.

The Compasses and Dividers are of the flat-half-round type. Corners and sharp edges are avoided as much as possible to make the handling more pleasant. Screws are placed between the legs so as not to obstruct the view when drawing.

ALCO "CIRCLE A" DRAWING INSTRUMENTS

Each instrument stamped ~~ALCO~~ Ⓐ

Another great advantage of the ALCO "Circle A" Drawing Instruments is the interchangeableness of all parts. Not only pen and pencil points of one pair of compasses will fit exactly into any other of the same size; the legs or any other parts of one instrument fit perfectly into any other, sizes, of course, being equal.

With all Compasses ordered in cases a screwdriver serving as leadbox and a metal handle is furnished whose hollow space holds several reserve needle points. This handle serves for inserting pen, pencil or needle point part, so that each of them may be used as a separate instrument.

SPRING BOW INSTRUMENTS

Are made in two distinctly different styles:
Style A. Instruments with ANNULAR spring, Fig. A (new style).
Style B. Instruments with FLAT spring, Fig B (old style).
We stock only the style A instruments.

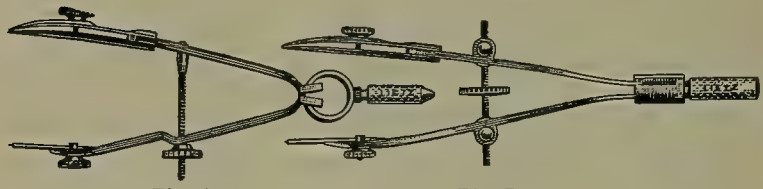


Fig. A Fig. B

Both styles are fitted either with side or center screw adjustment.

Bow instruments of the annular spring construction have the great advantage that the tension of the shanks remains nearly constant for any spread while Bows with flat springs (old style) become slacker the more they are opened. The shanks are made of German silver in this construction, whereby rusting is avoided.

The threads of the adjusting screws are all cut very deep and coarse, especially those of the center adjustment Bows, to insure quick motion and to avoid the disagreeable stripping.

All Steel Points Are Removable.

All Bows have instruments comparatively wide spread, especially with the 4¼-in. Bows, so a good deal of work may be done for which the heavier Compasses usually are too clumsy.

ALCO "CIRCLE A" DRAWING INSTRUMENTS

Each instrument stamped ~~ALCO~~ Ⓐ

Bow Instrument No. 1665 is a very serviceable complete pocket set for small work. In connection with the metal handle it contains all the instruments needed by a draughtsman for this kind of work.

IMPROVED ROTATING BOW PENS

All Rotating Compasses of the ordinary type have the disadvantage that the pen or pencil points move in an arc relative to the center point, and since a pen will draw properly only at one certain position to the paper, it follows that the angular changes occurring in the position of the pen point will necessarily mar the performance of the pen.

In Rotating Compasses Nos. 1668 and 1669 the introduction of a two-spring arrangement eliminates this defect entirely, it forces the pen point to remain parallel to the center point; the angle to the drawing surface being constant no matter what the size of the circle may be.

ALCO "CIRCLE A" DRAWING PENS

The Ruling Pens are made of the finest quality of steel. The material used in Pens Nos. 1600 to 1602 being made especially hard, they are unequalled for their extreme hardness and toughness.

Lateral motion of the blades is entirely overcome in the pens by T-bolt screws. The screws move freely and can adjust themselves to the position of the blades.

All Ruling Pens have metal handles.

ALCO "CIRCLE A" DRAWING INSTRUMENTS

Each instrument stamped ~~ALCO~~ Ⓐ

No. 1600 No. 1601 No. 1602 No. 1601C No. 1604 No. 1608 No. 1608C

No. 1600 Ruling Pen, 4½ in., spring blade, aluminum handle, extra hard and tough material $1.00

No. 1601 Ruling Pen, 5 in., spring blade, aluminum handle, extra hard and tough material $1.20

No. 1602 Ruling Pen, 5½ in., spring blade, aluminum handle, extra hard and tough material 1.35

No. 1600C Ruling Pen, 4½ in., with cross joint, aluminum handle.... 1.50

No. 1601C Ruling Pen, 5 in., with cross joint, aluminum handle.... 1.65

No. 1602C Ruling Pen, 5½ in., with cross joint, aluminum handle.... 1.80

The cross joint is a simple construction for rapidly opening and cleaning the pen. Maintains adjustment for width of lines without altering.

No. 1604 Ruling Pen, 5½ in., with graduated thumbscrew, aluminum handle 1.80

No. 1604C, same as No. 1604 with cross joint..... 2.40

The thumbscrews on Pens Nos. 1604-1604C are divided into 20 divisions, each alternate one marked with figure. One whole turn equals 1 m/m of width of line. The best arrangement for readjusting to width of line after cleaning.

No. 1608 Ruling Pen, 5 in., for fine lines, aluminum handle..... 1.50

No. 1608C, same as No. 1608 with cross joint..... 2.25

Pens Nos. 1608-1608C are excellent for very fine line work. Easily sharpened by merely grinding the slant.

ALCO "CIRCLE A" DRAWING INSTRUMENTS

Each instrument stamped ALCO Ⓐ

No. 1611 No. 1630 No. 1633 No. 1633D No. 1634 No. 1635 No. 1637

No. 1611A Swedish Ruling Pen, 5½ in., spoon shape, aluminum handle $1.35

No. 1612A Swedish Ruling Pen, 6 in., spoon shape, aluminum handle 1.50

No. 1630 Wedge Pen, 5 in., metal handle 1.50
By turning thumbscrew at upper end of handle a wedge is driven between the nibs.

No. 1633 Three-nib Ruling Pen, 5 in., for heavy lines..... 2.00

No. 1633D Border Pen, 6 in., metal handle 3.50
To draw at one stroke either a very heavy line or two lines of equal or different thicknesses.

No. 1634 *Curve Pen, 4¾ in., metal handle 1.65

No. 1635 *Double Curve Pen, 5¼ in., metal handle 4.80

No. 1637 Railroad Pen, 5¼ in., metal handle 2.70

*Pens Nos. 1634 and 1635 are fastened to a rod which swivels in the hollow handle and thus follows the smallest curve with precision. The rod may be locked by means of a nut at the upper end, and the instrument may be used as an ordinary drawing or railroad pen.

NOTE—For Catalog Nos. 1609 and 1612 to 1628 see pages 317 to 322.

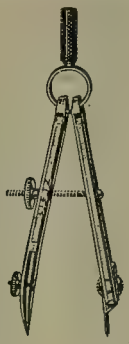
ALCO "CIRCLE A" DRAWING INSTRUMENTS

Each instrument stamped ~~ALCO~~ Ⓐ

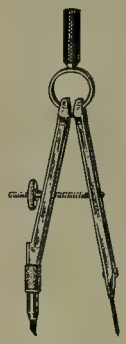
ANNULAR SPRING BOW INSTRUMENTS

The great advantage of instruments of this construction lies in the annular spring which keeps the shanks of the instruments always at the same tension, no matter how large or small the opening.

No. 1651



No. 1652



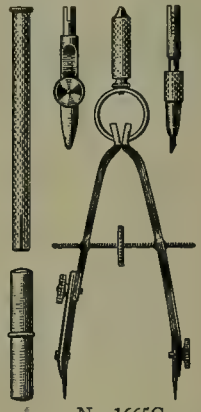
No. 1654

No. 1651 Annular Spring Bow Divider, German silver handle, 3½ in..... $2.00
No. 1652 Annular Spring Bow Pen, adjustable needle point, German silver handle, 3½ in..... 2.60
No. 1654 Annular Spring Pow Pencil, German silver handle, 3½ in..... 2.40
No. 1654C Set of three Annular Spring Bow Instruments, Nos. 1651, 1652 and 1654, in Morocco case..... 8.20

No. 1661

No. 1662

No. 1664



No. 1665C

No. 1661 Annular Spring Bow Divider, German silver handle, 4¼ in..... $3.00
No. 1662 Annular Spring Bow Pen, German silver handle, 4¼ in..... 3.60
No. 1664 Annular Spring Bow Pencil, German silver handle, 4¼ in..... 3.30
No. 1664C Set of three Annular Spring Bow Instruments, Nos. 1661, 1662 and 1664, in Morocco case..... 11.20
No. 1665C Annular Spring Bow Instrument, 4¼ in., with pen and pencil points, lead box and metal handle holding four reserve needle points, in Morocco case.... 6.00

ALCO "CIRCLE A" DRAWING INSTRUMENTS

Each instrument stamped ~~ALCO~~ Ⓐ

ROTATING DROP BOW INSTRUMENTS

No. 1668

No. 1667

No. 1669

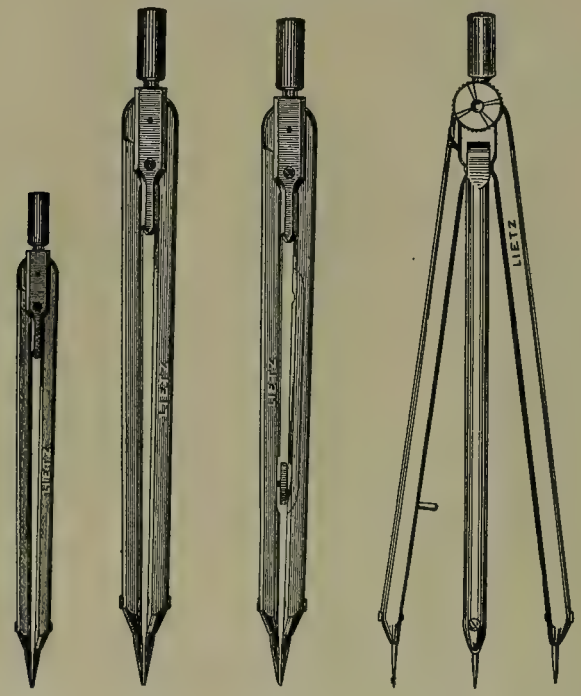
No. 1666 Rotating Drop Bow Pen with single spring, 4½ in	$2.75
No. 1666C, same as No. 1666, in velvet lined case	3.50
No. 1667 Rotating Drop Bow Instrument like No. 1666 but with pencil part	4.00
No. 1667C, same as No. 1667, in velvet lined case	4.75
No. 1668 Rotating Drop Bow Pen with double spring, 4½ in	3.00
No. 1668C, same as No. 1668, in velvet lined case	3.75
No. 1669 Rotating Drop Bow Instrument like No. 1668 but with pencil part	4.25
No. 1669C, same as No. 1669, in velvet lined case	5.00

Further description of the above instruments on page 307.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE A" DRAWING INSTRUMENTS

Each instrument stamped ~~ALCO~~ Ⓐ



No. 1680-1 No. 1680-2 No. 1681-2 No. 1680-3L

No. 1680-1 Plain Dividers, 4 in., with replaceable steel points.....	$2.25
No. 1680-2 Plain Dividers, 5¾ in., with replaceable steel points.....	2.70
No. 1681-1 Hairspring Dividers, 4 in., with replaceable steel points..	3.20
No. 1681-2 Hairspring Dividers, 5¾ in., with replaceable steel points	3.60
No. 1680-3L Three-legged Dividers with replaceable steel points, for transferring to scale, 5½ in.	5.00

All Dividers equipped with straightening device.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE A" DRAWING INSTRUMENTS

Each instrument stamped ~~ALCO~~ Ⓐ

No. 1682N No. 1684 No. 1684H

No. 1682N Compass, 4 in., with replaceable needle points, divider, pen and pencil parts	$5.40
No. 1683N, same as No. 1682N but 5 in.	5.50
No. 1684 Compass, 6 in., with replaceable needle points, divider, pen and pencil parts and lengthening bar	6 50
No. 1684H, same as No. 1684 but with hairspring	7.50

All Compasses equipped with straightening device.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE A" DRAWING INSTRUMENTS

Exta Parts

No. 1685

No. 1685-1	Measure Marker, for marking centimeters and millimeters	$0.90
2	Pricker, 2¾ in., flat, to prevent rolling off the drawing board	.90
3	Pricker, 2¾ in. The needle held by a small clutch can be readily exchanged. Any sewing needle will fit	.90
4	Combination Key and Leadbox	.25
5	Metal Handle, 2½ in., holding four needle points	.45
6	Metal Handle, 3 in., holding four needle points	.50
	These handles fit the pen, pencil and needle parts of Compasses, any one of which can, in connection with the handle, be used as a separate instrument.	
7	Center Tack, avoids the disagreeable enlarging of centers in paper	.15
9	Aluminum Handles for Ruling Pens	.25
11	German silver Handle for Bow Instruments	.25
13	Screws or bolt and nut for pens	.35
14	Bolts for side motion bow instruments	.30
15	Center Motion Screw with left and right thread	.40
16	Divider or needle point part for Nos. 1665C-1669, etc.	1.25
18	Pen part for Nos. 1665C-1669, etc	1.25
19	Pencil part for Nos. 1665C-1669, etc.	1.25
20	Divider or needle point part for No. 1682, etc.	1.35
21	Pencil part for No. 1682, etc.	1.35
22	Pen part for No. 1682, etc.	1.35
23	Divider or needle point part for No. 1684, etc.	1.50
24	Pencil part for No. 1684, etc.	1.50
25	Pen part for No. 1684, etc.	1.50
26	Lengthening Bar for 4 in. Compasses	1.25
27	Lengthening Bar for 6 in. Compasses	1.50

For Needle Points, extra boxes of Leads, Horn Centers, etc., see bottom of page 288.

Empty cases for Drawing Instruments listed on page 361.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE A" DRAWING INSTRUMENTS

Each instrument stamped ALCO Ⓐ

No. 1690 No. 1691 No. 1692 No. 1693 No. 1694 No. 1695

No. 1690 Spline Pen, 4¾ in. $1.75
Used in conjunction with splines, ship curves, adjustable curves, etc. A small blade fastened to the pen serves as a guide to follow curve.

No. 1691 Cross Hatching Pen, 5 in., aluminum handle..... 1.75
This pen is fitted with an adjustable third blade as guide for maintaining a uniform distance of lines in cross-hatching and is worked in this way that the point of this blade, after being adjusted to the desired distance, is run along the previously drawn line.

No. 1692 Pocket Pen, 5 in., aluminum tube serving either as handle or protecting sheath 1.50

No. 1693 Rotating Compasses, 4¼ in., with etching needle and graduated screw, in morocco case..... 4.00
It is advisable to use both hands in using this compass. Hold head of center pin with forefinger of right hand and effect rotation with left.

No. 1694 Double Tracer, 5 in., spanning 9/16 in..... 2.00

No. 1695-1 Spring Dividers with etching needle, spanning 1½ in..... 4.75

No. 1695-2 Spring Dividers with adjustable steel points, spanning 3 in. 5.50

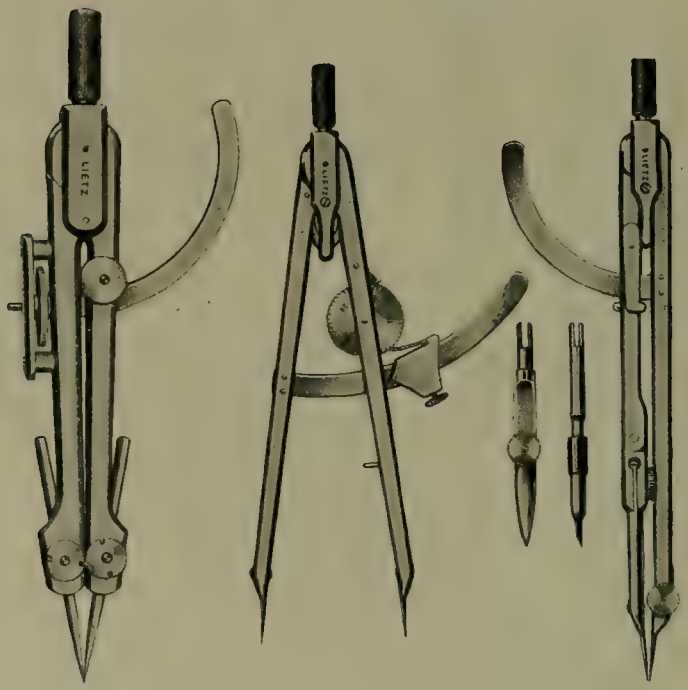
No. 1695-3 Spring Dividers with adjustable steel points, spanning 6 in. 6.00
Spring Dividers of the ordinary construction require considerable time in adjusting. This drawback is overcome in our instruments Nos. 1695-1 to 1695-3 by an adjusting screw with notches at equal distances, by means of which they can at once be set for approximately the distance required, the final adjustment only being effected by the regulating screw.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE A" DRAWING INSTRUMENTS

Each instrument stamped ~~ALCO~~ Ⓐ

INSTRUMENTS FOR LITHOGRAPHERS



Nos. 1696-1697 No. 1698 No. 1699

No. 1696 Lithographers' Etching Compass, 5¾ in., very strong, with arc and micrometer adjustment. In morocco case.....	$12.00
No. 1696ED, Same as No. 1696 but with etching diamond.....	15.00
No. 1697 Lithographers' Etching Compass, like No. 1696 but 8¼ in. In morocco case	15.00
No. 1697ED, Same as No. 1697 but with etching diamond.....	18.00
No. 1698 Lithographers' Dividers, 5¾ in., with arc and recording wheel	8.50
No. 1699 Lithographers' Compass, 6 in., with arc and automatic clamping device, divider, pen and pencil parts.....	6.00

Nos. 1698 and 1699 are equipped with straightening device.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE A" DRAWING INSTRUMENTS

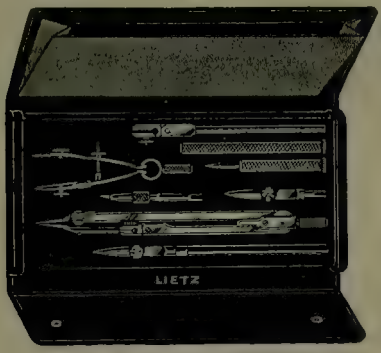
In Fine Morocco Cases

Each instrument stamped ~~ALCO~~ Ⓐ

No. 1609BL

No. 1609BL Bar Lock Case, velvet lined, containing:
- No. 1682N Compasses, 4 in., with replaceable needle points, divider, pen and pencil parts.....
- No. 1685-4 Combination Key and Leadbox.....
- No. 1685-5 Metal Handle with four needle points.....

Per set $7.75



No. 1612PB

No. 1612PB Pocket Book Case, velvet lined, containing:
- No. 1601 Ruling Pen, 5 in.....
- No. 1652 Annular Bow Pen, 3½ in.....
- No. 1684 Compass, 6 in., with replaceable needle points, divider, pen and pencil parts, and lengthening bar.....
- No. 1685-4 Combination Key and Leadbox.....
- No. 1685-6 Metal Handle with four needle points.....
- No. 1685-7 Center Tack .....

Per set $13.50

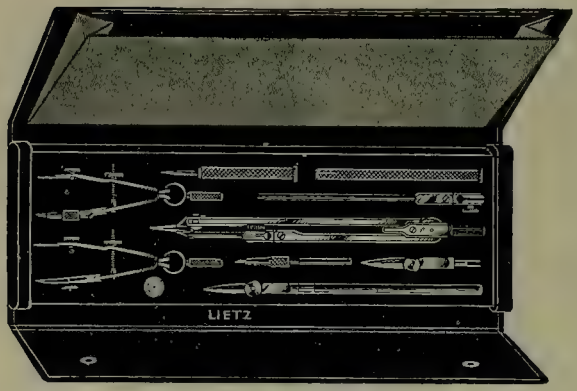
Dividers and Compasses equipped with straightening device.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE A" DRAWING INSTRUMENTS

In Fine Morocco Cases

Each instrument stamped ~~ALCO~~ Ⓐ



No. 1613PB

No. 1613PB Pocket Book Case, velvet lined, containing:

No. 1601 Ruling Pen, 5 in.....
No. 1652 Annular Spring Bow Pen, 3½ in.....
No. 1654 Annular Spring Bow Pencil, 3½ in.....
No. 1684 Compass, 6 in., with replaceable needle points, divider, pen and pencil parts, lengthening bar.....
No. 1685-4 Combination Key and Leadbox.....
No. 1685-6 Metal Handle with four needle points.....
No. 1685-7 Center Tack .....
Per set $16.50

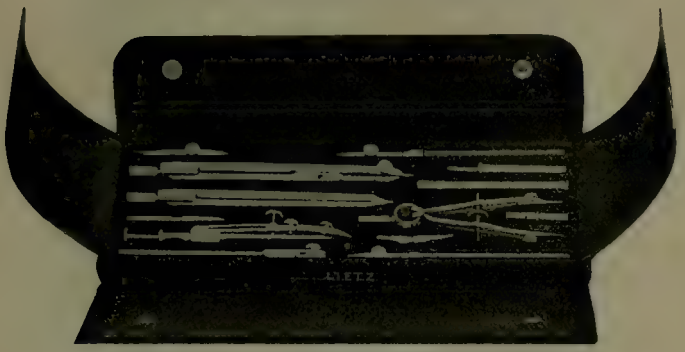
Dividers and Compasses equipped with straightening device.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE A" DRAWING INSTRUMENTS

In Fine Morocco Cases

Each instrument stamped ~~ALCO~~ Ⓐ



No. 1621PB

No. 1621PB Pocket Book Case, velvet lined, containing:

No. 1600 Ruling Pen, 4½ in.....
No. 1601 Ruling Pen, 5 in.....
No. 1651 Steel Spring Bow Divider, 4¼ in.....
No. 1669 Rotating Drop Bow Pen, 4½ in., with pencil point.
No. 1681-2 Hairspring Divider, 5¾ in., with replaceable steel points .....
No. 1684 Compass, 6 in., with replaceable needle points, divider, pen and pencil parts, lengthening bar.....
No. 1685-4 Combination Key and Leadbox.....
No. 1685-6 Metal Handle, 3 in., with four needle points for parts of 1684.....
No. 1685-7 Center Tack .....
Per set $24.00

No. 1621PBH, same as No. 1621PB, but with Hairspring Compass No. 1684H in lieu of No. 1684. Per set..... 25.00

Dividers and Compasses equipped with straightening device.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE A" DRAWING INSTRUMENTS

In Fine Morocco Cases

Each instrument stamped ~~ALCO~~ Ⓐ

No. 1624PBH

No. 1624PB Pocket Book Case, velvet lined, containing:
- No. 1600 Ruling Pen, 4½ in.....
- No. 1601 Ruling Pen, 5 in.....
- No. 1651 Annular Spring Bow Divider, 3½ in.....
- No. 1652 Annular Spring Bow Pen, 3½ in.....
- No. 1654 Annular Spring Bow Pencil, 3½ in.....
- No. 1681-2 Hairspring Divider, 5¾ in., with replaceable steel points..
- No. 1684 Compass, 6 in., with replaceable needle points, divider, pen and pencil parts, lengthening bar and straightening device.....
- No. 1685-4 Combination Key and Leadbox.....
- No. 1685-6 Metal Handle, with four needle points.....
- No. 1685-7 Center Tack .....

Per set $23.50

No. 1624PBH, Same as No. 1624PB, but with Hairspring Compass No. 1684H in lieu of No. 1684. Per set 24.50

No. 1625PB, Same as No. 1624PB, but with center wheel Bow Instruments Nos. 1661, 1662 and 1664 in lieu of Nos. 1651, 1652 and 1654. Per set.... 26.50

No. 1625PBH, Same as No. 1625PB, but with Hairspring Compass No. 1684H in lieu of No. 1684. Per set..... 27.50

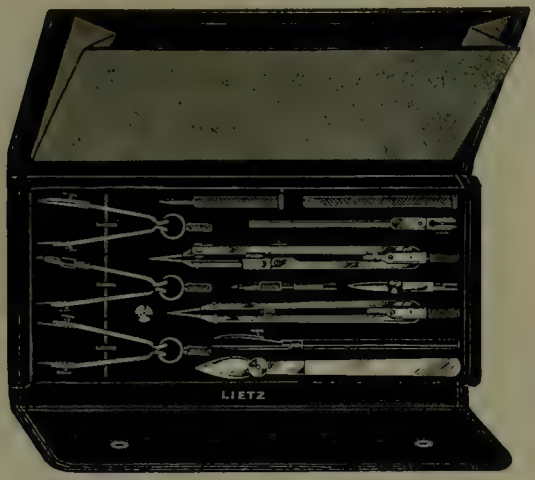
Dividers and Compasses equipped with straightening device.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE A" DRAWING INSTRUMENTS

In Fine Morocco Cases

Each instrument stamped ~~ALCO~~ Ⓐ



No. 1626PBH

No. 1626PB Pocket Book Case, velvet lined, containing:

No. 1600 Ruling Pen, 4½ in.....
No. 1612A Swedish Pen, 6 in.....
No. 1661 Annular Spring Bow Divider, 4¼ in.....
No. 1662 Annular Spring Bow Pen, 4¼ in.....
No. 1664 Annular Spring Bow Pencil, 4¼ in.....
No. 1681-2 Hairspring Divider, 5¾ in., with replaceable steel points.
No. 1684 Compass, 6 in., with replaceable needle points, divider, pen and pencil parts, lengthening bar.....
No. 1685-4 Combination Key and Leadbox.....
No. 1685-6 Metal Handle, with four needle points, for parts of 1684..
No. 1685-7 Center Tack .....
Per set $26.00

No. 1626PBH, same as No. 1626PB, but with Hairspring Compass No. 1684H in lieu of No. 1684. Per set..... 27.00

No. 1627PBH, same as No. 1626PBH, but with (in addition) 1634 Curve Pen 4¾ in., 1635 Double Curve Pen 5¼ in. Per set..... 33.50

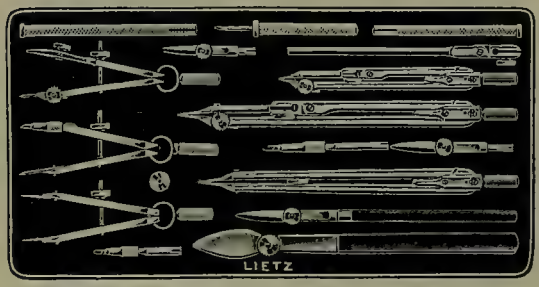
Dividers and Compasses equipped with straightening device.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE A" DRAWING INSTRUMENTS

In Fine Morocco Cases

Each instrument stamped ~~ALCO~~ Ⓐ



No. 1628PB

No. 1628PB Pocket Book Case, velvet lined, containing:

No. 1601 Ruling Pen, 5 in.	
No. 1612A Swedish Ruling Pen, 6 in.	
No. 1651 Annular Spring Bow Divider, 3½ in.	
No. 1652 Annular Spring Bow Pen, 3½ in.	
No. 1654 Annular Spring Bow Pencil, 3½ in.	
No. 1681-2 Hairspring Divider, 5¾ in.	
No. 1682N Compass, 4 in., with divider, pen and pencil parts	
No. 1684 Compass, 6 in., with divider, pen and pencil parts.	
No. 1685-4 Combination Key and Leadbox	
No. 1685-5 Metal Handle with four needle points, for parts of No. 1682N	
No. 1685-6 Metal Handle with four needle points, for parts of No. 1684	
Per set	$29.00
No. 1628PBH, Same as No. 1628PB, but with Hairspring Compass No. 1684H in lieu of No. 1684. Per set	30.00

Dividers and Compasses equipped with straightening device.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE A" DRAWING INSTRUMENTS

In Polished Black Walnut Case

Each instrument stamped ~~ALCO~~ Ⓐ

No. 1629

No. 1629 Polished Black Walnut Case with lock, velvet lined, containing:

No. 1600 Ruling Pen, 4½ in.	
No. 1601 Ruling Pen, 5 in.	
No. 1602 Ruling Pen, 5½ in.	
Dotting Instrument	
Dotting Instrument, for beam compass	
No. 1661 Annular Spring Bow Divider, 4¼ in.	
No. 1662 Annular Spring Bow Pen, 4¼ in.	
No. 1664 Annular Spring Bow Pencil, 4¼ in.	
No. 1669 Rotating Drop Bow Pen with pencil part, 4¼ in.	
No. 1681-2 Hairspring Divider, 5¾ in.	
No. 1684H Hairspring Compass, 6 in., with pen, divider, and pencil parts, lengthening bar	
Beam Compass, with wooden bar	
No. 1685-3 Pricking Point	
No. 1685-4 Combination Key and Leadbox	
No. 1685-5 Metal Handle, 3 needle points for parts of 1669	
No. 1685-6 Metal Handle, 3 needle points for parts of 1684H	
No. 1685-7 Three Center Tacks	
Per set	$55.00

Dividers and Compasses equipped with straightening device.

NOTE—For Catalog Numbers 1630 to 1699 see pages 309 to 316.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE L" DRAWING INSTRUMENTS

Each instrument stamped ~~ALCO~~ Ⓛ

Of finest hard rolled German silver, white wrought metal and highest grade tool steel.

Features of the Compasses.

Embodying improved pivot joint construction, head true and nicely fitted. Design does not permit of looseness. Patent clamp to lock instrument in any position. Straightening device to keep handle in perpendicular position at all times.

Double Steel Knee Joint

Slip Shank Fitting

These features prevent looseness, increasing their durability to a very large degree. The insertion joints are nicely fitted and very strong, making the clamp screw almost unnecessary.

THE PATENT NEEDLE ADJUSTMENT

as embodied in our Alco "Circle L" Compasses and Bow Instruments offers an advantage which is self-evident. By its simplicity one can regulate the needle to a nicety and very much quicker than in the old way.

For very fine work this feature should prove invaluable, serving, as it does, the duty of a micrometer.

THE DIVIDER POINTS

are so made that they are readily interchanged or replaced by simply turning the clamp screw, overcoming thereby the troublesome regrinding of the broken points.

ALCO "CIRCLE L" DRAWING INSTRUMENTS

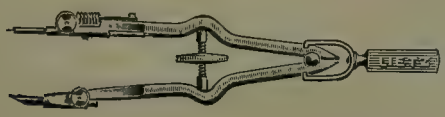
Each instrument stamped ~~ALCO~~ ©

The Ruling Pens which constitute our **ALCO** "Circle L" line, both separate and in sets, are fitted with the patent Slide Catch feature. We firmly believe that of all the devices which have been attempted to aid the draftsman in the opening and cleaning of the Ruling Pen this idea the neatest, quickest and simplest of any yet devised.

Closed

Open

In order **to open** the pen (when closed) hold firmly, engaging the slide catch with thumb and in this manner the opening and closing is controlled; the latter by bringing pressure to bear as catch is slid forward.

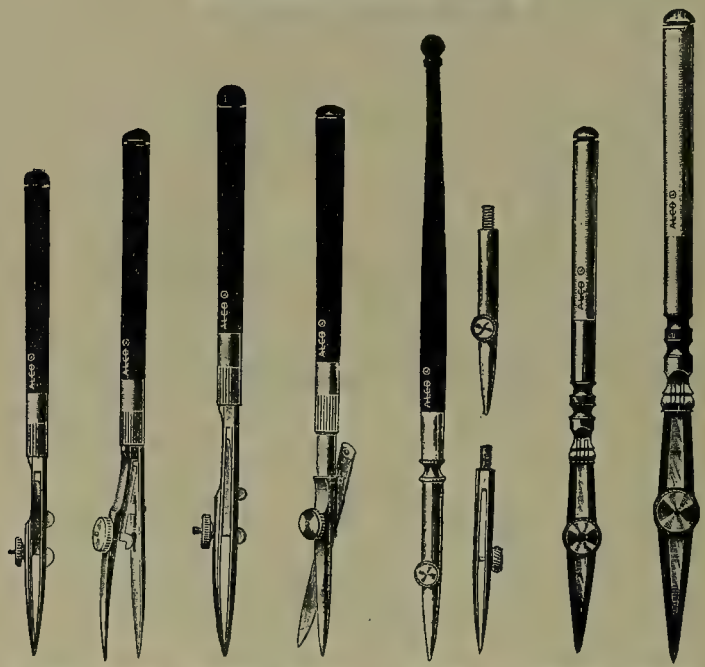


BOW INSTRUMENTS

The innovation in design of these bow instruments has eliminated the troublesome stripping of the threads. Being of spring construction with inserted left and right threaded nuts, the life of the bow is indefinite. The tension remains almost constant whereas the old form, due to unequal wear or strain, are soon worn out. Please note that the threaded ends of the center wheel never project beyond the side of the bow.

ALCO "CIRCLE L" DRAWING INSTRUMENTS

Each instrument stamped ~~ALCO~~ Ⓛ



No. 1700 No. 1701 No. 1702 No. 1701C No. 1705 No. 1707 No. 1709

No. 1700	Ruling Pen, 4½ in., slide catch opening, ebony handle...	$1.00
No. 1701	Ruling Pen, 5 in., slide catch opening, ebony handle...	1.05
No. 1702	Ruling Pen, 5½ in., slide catch opening, ebony handle...	1.10
No. 1700A	Ruling Pen, 4½ in., slide catch opening, aluminum handle	1.10
No. 1701A	Ruling Pen, 5 in., slide catch opening, aluminum handle	1.15
No. 1702A	Ruling Pen, 5½ in., slide catch opening, aluminum handle	1.20
No. 1700C	Ruling Pen, 4½ in., with cross joint, ebony handle.....	1.10
No. 1701C	Ruling Pen, 5 in., with cross joint, ebony handle.....	1.20
No. 1704	Hatching Pen, 5 in., with pushing screw, ebony handle..	.85
No. 1705	Hatching Pen, 5 in., like No. 1704, but 3 pens for one handle. In case	2.50
No. 1707*	Ruling Pen, 4½ in., with joint and pin, ivory handle.....	.85
No. 1708*	Ruling Pen, 5 in., with joint and pin, ivory handle.....	.90
No. 1709*	Ruling Pen, 5½ in., with joint and pin, ivory handle.....	.95

*Ruling Pens Nos. 1707-1709 can be furnished with aluminum handles in place of ivory handles at same prices. Order by adding "A" to catalog number.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE L" DRAWING INSTRUMENTS

Each instrument stamped ~~ALCO~~ ©

No. 1710 No. 1711 No. 1712 No. 1713 No. 1714 No. 1715 No. 1717

No. 1710	Swedish Ruling Pen, 5 in., ebony handle	$0.85
No. 1711	Swedish Ruling Pen, 6 in., ebony handle	.95
No. 1712	Swedish Ruling Pen, 7 in., ebony handle	1.05
No. 1710A	Swedish Ruling Pen, 5 in., aluminum handle	.95
No. 1711A	Swedish Ruling Pen, 6 in., aluminum handle	1.05
No. 1712A	Swedish Ruling Pen, 7 in., aluminum handle	1.15
No. 1713	Detail and Border Pen, 6½ in., for double lines, ebony handle	2.00
No. 1714*	Curve Pen, 5½ in., metal handle	1.50
No. 1715*	Double Curve or Railroad Pen, 5½ in., metal handle	4.25
No. 1717	Railroad Pen, 6 in., with joints, ivory handle	2.50

*Pens Nos. 1714 and 1715 are fastened to a rod which swivels in the hollow handle and thus follows the smallest curve with precision. The rod may be locked by means of a nut at the upper end, and the instrument may be used as an ordinary drawing or railroad pen.

For prevailing prices see latest supplementary price list. *Page 327.*

ALCO "CIRCLE L" DRAWING INSTRUMENTS

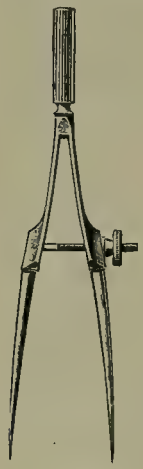
Each instrument stamped ~~ALCO~~ Ⓛ

No. 1730

No. 1732

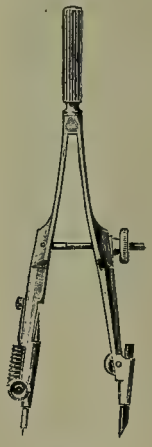
No. 1734

No. 1730 Minute Steel Spring Bow Divider, German silver handle, 2 in. $1.10
No. 1732 Minute Steel Spring Bow Pen, German silver handle, 2 in. 1.45
No. 1734 Minute Steel Spring Bow Pencil, German silver handle, 2 in. 1.45
No. 1734C Set of 3 Steel Spring Bow Instruments, Nos. 1730, 1732 and 1734, in morocco case 4.90



No. 1750

No. 1752



No. 1754

No. 1750 Steel Spring Bow Divider, German silver handle, 3¾ in.... $1.10
No. 1752 Steel Spring Bow Pen, German silver handle, 3¾ in..... 1.45
No. 1754 Steel Spring Bow Pencil, German silver handle, 3¾ in..... 1.45
No. 1734C Set of 3 Steel Spring Bow Instruments, Nos. 1750, 1752 and 1754, in morocco case..... 4.90

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE L" DRAWING INSTRUMENTS

Each instrument stamped ~~ALCO~~ Ⓛ

No. 1761

No. 1762

No. 1764

No. 1761 Bow Divider, new center adjustment, removable steel points, German silver handle and legs, 3½ in..... $1.75

No. 1762 Bow Pen, new center adjustment, German silver handle and legs, 3½ in..... 2.00

No. 1764 Bow Pencil, new center adjustment, German silver handle and legs, 3½ in..... 2.00

No. 1764C Set of 3 Bow Instruments, Nos. 1761, 1762 and 1764, in morocco case 6.75

No. 1766

No. 1767

No. 1766 Rotating Drop Spring Bow Pen, 4 in..... $2.00

No. 1766C, Same as No. 1766, in morocco case..... 3.00

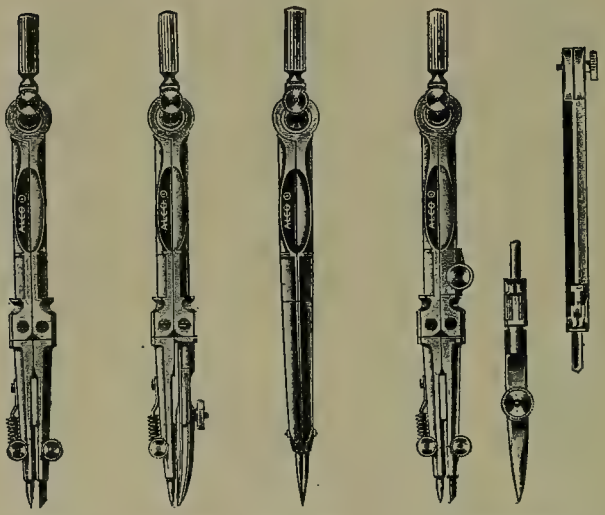
No. 1767 Rotating Drop Spring Bow Instrument with pen and pencil parts, 4 in. 3.00

No. 1767C, Same as No. 1767, in morocco case..... 4.00

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE L" DRAWING INSTRUMENTS

Each instrument stamped ~~ALCO~~ Ⓛ



No. 1783B No. 1783A No. 1780-1 No. 1782¾

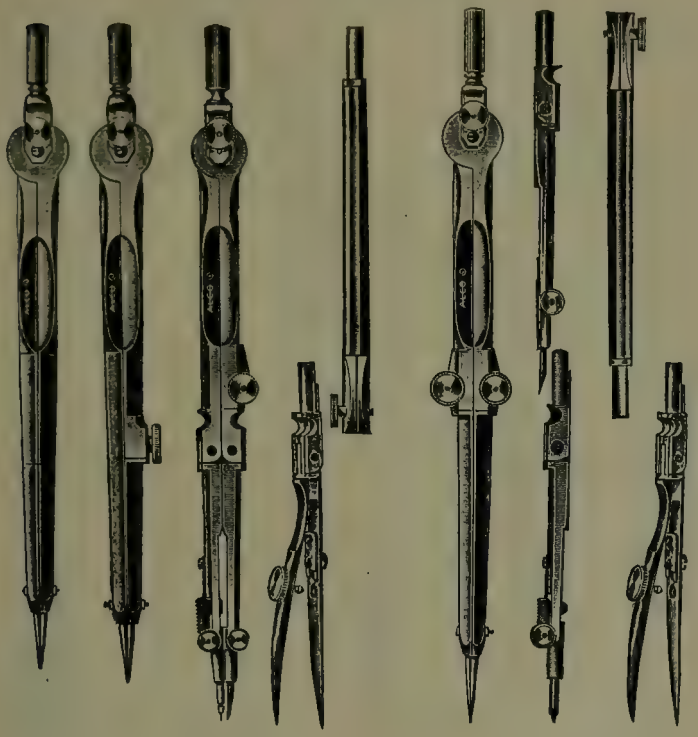
No. 1780-1	Plain Divider, 4¼ in.	$1.35
No. 1782¾	Compass, 4¼ in., adjustable needle point, pen and pencil parts and lengthening bar	4.00
No. 1783A	Compass, 4¼ in., adjustable needle point and pen part with spring blade	2.75
No. 1783B	Compass, 4¼ in., adjustable needle point and pencil part	2.75

All Dividers and Compasses equipped with straightening device and patent clamp.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE L" DRAWING INSTRUMENTS

Each instrument stamped ~~ALCO~~ Ⓛ



No. 1780-2 No. 1781 No. 1784¾ No. 1784-4

No. 1780-2 Plain Divider, 6 in.	$1.50
No. 1781 Hairspring Divider, 6 in.	2.20
No. 1784¾ Compass, 6 in., adjustable needle point, pen with slide catch opening, pencil part and lengthening bar	4.50
No. 1784¾H, Same as No. 1784¾, but with hairspring	5.10
No. 1784-4 Compass, 6 in., two steel points, pen with slide catch opening, pencil part, needle point, lengthening bar and two shoulder needles	5.10

All Dividers and Compasses equipped with straightening device and patent clamp.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE L" DRAWING INSTRUMENTS

Each instrument stamped ~~ALCO~~ Ⓛ

No. 1780-2P No. 1780-1½ No. 1780-3L No. 1784P

No. 1780-2P Pocket Divider, 5 in., with metal sheath	$1.60
No. 1780-1½ Whole and Half Dividers, 6½ in.	2.50
No. 1780-3L Three-legged Divider, 5 in.	3.00
No. 1784P Pocket Compass, 4½ in., with folding parts	5.60

NOTE—For Catalog Nos. 1785-1787, extra parts for ALCO "Circle L" Drawing Instruments, see page 360.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE L" DRAWING INSTRUMENTS

Each instrument stamped ~~ALCO~~ Ⓛ

No. 1790-1 and 2

No. 1791

No. 1792

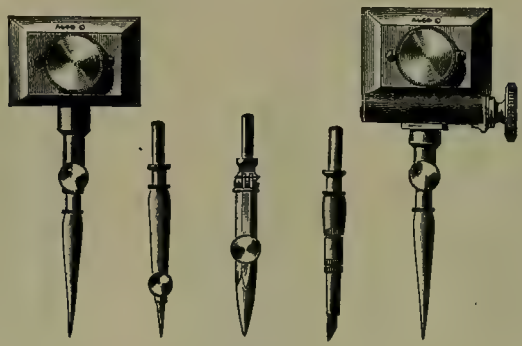
No. 1790-1	Proportional Divider, 7¼ in., for lines and circles	$7.00
No. 1790-2	Proportional Divider, 9¼ in., for lines and circles	9.50
No. 1791	Proportional Divider, 7¼ in., with rack movement, for lines, circles, planes and solids	9.50
No. 1792	Proportional Dividers, 9¼ in., with micrometer adjustment, for lines and circles	12.80
No. 1790C	Cases, velvet lined, with bar lock for Proportional Dividers Nos. 1790-1792	1.00

For other Proportional Dividers see pages 289 and 364

For prevailing prices see latest supplementary price list.

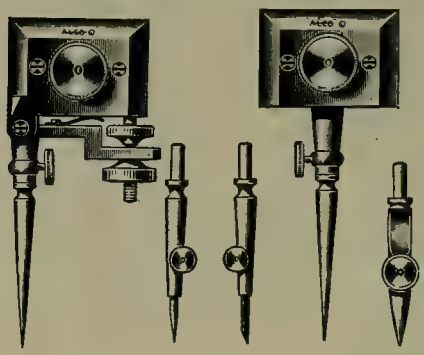
ALCO "CIRCLE L" DRAWING INSTRUMENTS

Each instrument stamped ~~ALCO~~ Ⓛ

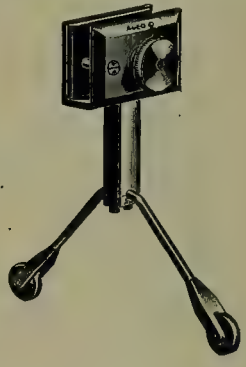


No. 1795

No. 1795 Beam Compass with two steel points, pen, pencil and needle parts, lateral micrometer adjustment $7.00
No. 1795C, same as No. 1795 in morocco velvet-lined case..... 8.75



No. 1796



No. 1797

No. 1796 Beam Compass with two steel points, pen, pencil and needle parts, vertical micrometer adjustment $7.00
No. 1796C, same as No. 1796 in morocco velvet-lined case..... 8.75
No. 1797 Wheel Attachment or Balance for Beam Compasses Nos. 1795 and 1796.... 2.25
No. 1797C Case only, velvet-lined, to contain Beam Compass No. 1795 and attachment No. 1797 ..... 2.00
No. 1798C Case only, velvet-lined, to contain Beam Compass No. 1796 and attachment No. 1797 ..... 2.00

For other Beam Compasses see pages 290, 335, 336, 337 and 368.
For Beam Compass Bars (hardwood) see page 291.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE L" DRAWING INSTRUMENTS

Each instrument stamped ~~ALCO~~ Ⓛ

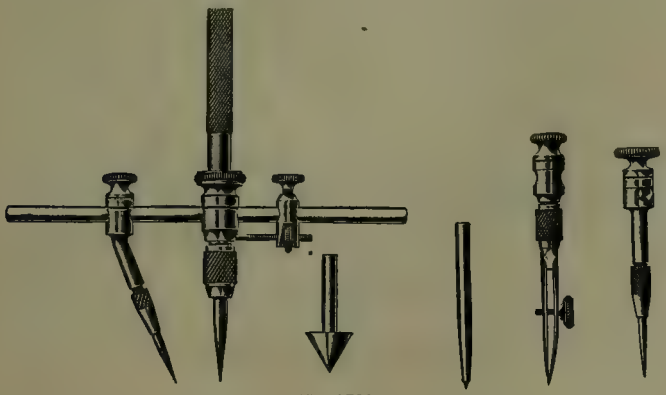
No. 1796½

No. 1796½ Minute Beam Compass with two steel points, pen, pencil and needle parts, vertical micrometer adjustment..... $7.00

No. 1796½C, same as No. 1796½ in morocco velvet-lined case..... 8.75

No. 1797½ Wheel Attachment or Balance for Beam Compass No. 1796½ 2.25

No. 1798½ Case only, velvet lined, to contain Beam Compass No. 1796½ and attachment No. 1797½..... 2.00



No. 1799

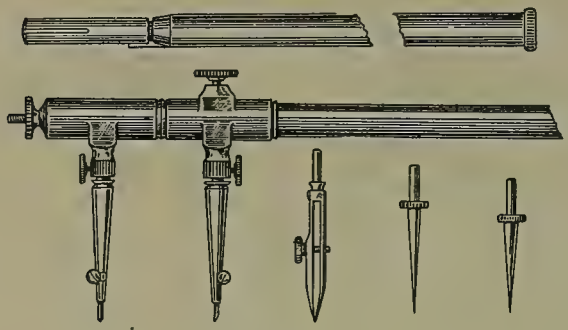
No. 1799 Universal Beam Compass with one each straight and bent needle or pencil point, pen and divider parts, also blunt center point for use when scribing around a drilled hole. With two metal bars, 13 and 30 inches long..... $5.00

For other Beam Compasses see pages 290, 334, 336, 337 and 368.
For Beam Compass Bars (hardwood) see page 291.

For prevailing prices see latest supplementary price list.

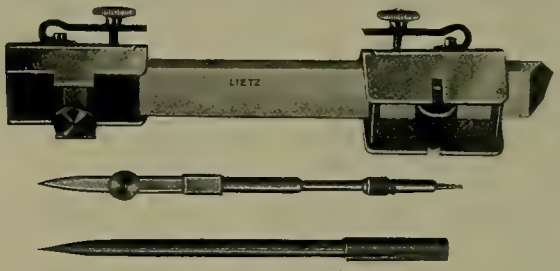
ALCO "CIRCLE L" DRAWING INSTRUMENTS

Each instrument stamped ~~ALCO~~ Ⓛ



No. 1800

No. 1800 Tubular Beam Compass, 18 in., 2 round German silver bars, with 2 steel points, pen, pencil and needle point, with micrometer adjustment $10.50
No. 1800C, same as No. 1800 in morocco velvet-lined case 12.75
No. 1801 Tubular Beam Compass, same as No. 1800, but 24 in., and 3 round German silver bars 11.75
No. 1801C, same as No. 1801 in morocco velvet-lined case 14.25
No. 1802 Tubular Beam Compass, same as No. 1800, but 36 in., and 3 round German silver bars 15.25
No. 1802C, same as No. 1802 in morocco velvet-lined case 18.00
No. 1803A Wheel attachment or balance for Beam Compasses Nos. 1800 or 1801 ..... 2.50
No. 1803B Wheel attachment or balance for Beam Compass No. 1802 ..... 2.75
Prices of cases Nos. 1800C, 1801C, and 1802C, including space for wheel attachment, extra ..... .50



Nos. 1804-1805

No. 1804 Beam Compass with steel center point, reversible pen and pencil parts and five-cornered wooden beam 20 inches long $5.75
No. 1804C, same as No. 1804 in morocco case 7.00
No. 1805 Beam Compass, same as No. 1804, but five-cornered wooden beam 40 inches long 6.75
No. 1805C, same as No. 1805 in morocco case 8.00

Beam Compasses Nos. 1804-1805 are so constructed that any ruling pen or ordinary pencil may be inserted.

For other Beam Compasses see pages 290, 334, 335, 337 and 368.

For prevailing prices see latest supplementary price list.

RIEFLER'S BEAM COMPASS

No. 1806

No. 1806 Riefler's Tubular Beam Compass, 18 in., 2 round German silver bars, with 2 steel points, pen, pencil and needle point, with micrometer adjustment $10.50

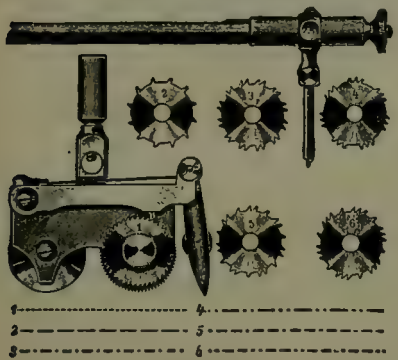
No. 1806C, same as No. 1806 in morocco velvet-lined case..... 12 75

No. 1807 Riefler's Tubular Beam Compass, same as No. 1806, but 25 inch, and 3 round German silver bars..... 11.75

No. 1807C, same as No. 1807 in morocco velvet-lined case..... 14.25

RIEFLER'S DOTTING INSTRUMENT

For Drawing Dotted, Straight and Circular Lines in any Desirable Thickness



No. 1808

This Dotting Instrument is very practical and most reliable.

It consists of a German silver frame, on which runs a toothed guide wheel and in front of it a round-faced guide wheel, holding the instrument in a vertical position while in use.

The Dotting Wheel is fastened to the axis of the toothed guide wheel by means of a screw and runs on the outside of the frame, which admits of an easy interchanging of the different wheels. The numbered side of the Dotting Wheel must be placed towards the outside.

The pen is attached to a lever, from which a ratchet projects, resting on the Dotting Wheel and causing the pen to rise and fall according to the notches in the Dotting Wheel. Care should be taken to adjust the ruling pen to the right position before using the instrument.

For circular lines the instrument is slipped over the round bar and fastened by means of the screw on the handle, on the other end of which a needle point with micrometer screw is attached. The bar being 11 inches long, circles up to 21 inches diameter can be drawn.

No. 1808C Riefler's Dotting Instrument, with 6 dotting wheels and micrometer bar 11 in. long, in morocco case..... $8 50

No. 1808½C, same as No. 1808C, but without micrometer bar, and fitted for Riefler's Beam Compasses Nos. 1806-1807, in morocco case 5.75

No. 1808W Separate Wheels, Nos. 1 to 6. Each..... .75

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE L" DRAWING INSTRUMENTS

In Fine Morocco Cases

Each instrument stamped ~~ALCO~~ Ⓛ

No. 1810PB

No. 1810BL Bar Lock Case, velvet lined, containing:

No. 1702 Ruling Pen, 5½ in., slide catch opening.....
No. 1780-2 Plain Divider, 6 in. .....
No. 17843/4 Compass, 6 in., adjustable needle point, pen and pencil parts and lengthening bar.....
Box with reserve needle points.....
Combination Key and Leadbox.....
Per set $8.80

No. 1810PB, Same as No. 1810BL, but in Pocket Book Case with folding flaps. Per set 9.00

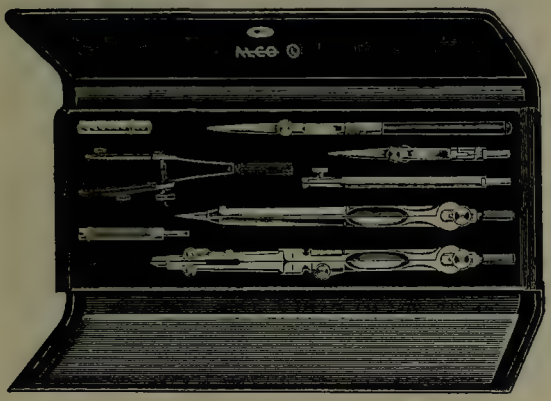
All Dividers and Compasses equipped with straightening device and patent clamp.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE L" DRAWING INSTRUMENTS

In Fine Morocco Cases

Each instrument stamped ~~ALCO~~ Ⓛ



No. 1812PB

No. 1812BL Bar Lock Case, velvet lined, containing:
No. 1702 Ruling Pen, 5½ in., slide catch opening.....
No. 1752 Steel Spring Bow Pen, 3¾ in. .....
No. 1780-2 Plain Divider, 6 in. .....
No. 1784¾ Compass, 6 in., adjustable needle point, pen and pencil parts and lengthening bar.....
Box with reserve needle points.....
Combination Key and Leadbox.....
Per set $10.55

No. 1812PB, Same as No. 1812BL, but in Pocket Book Case with folding flaps. Per set..... 10.70

No. 1812CBL, Same as No. 1812BL, but with Center Wheel Bow Instrument No. 1762 in lieu of No. 1752. Per set..... 11.10

No. 1812CPB, Same as No. 1812PB, but with Center Wheel Bow Instrument No. 1762 in lieu of No. 1752. Per set..... 11.25

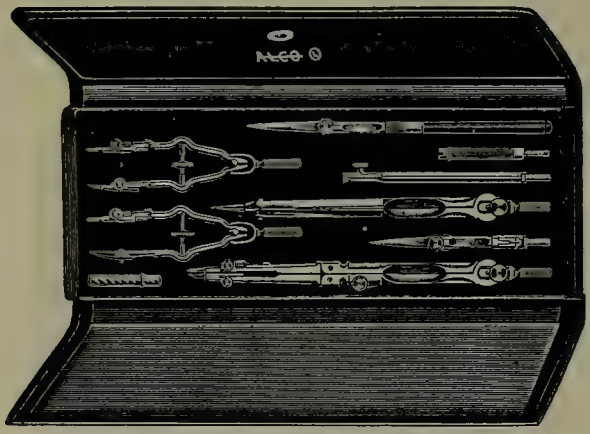
All Dividers and Compasses equipped with straightening device and patent clamp.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE L" DRAWING INSTRUMENTS

In Fine Morocco Cases

Each instrument stamped ~~ALCO~~ Ⓛ



No. 1813CPB

No. 1813BL Bar Lock Case, velvet lined, containing:
No. 1702 Ruling Pen, 5½ in., slide catch opening.....
No. 1752 Steel Spring Bow Pen, 3¾ in. .....
No. 1754 Steel Spring Bow Pencil, 3¾ in. .....
No. 1780-2 Plain Divider, 6 in. .....
No. 1784¾ Compass, 6 in., adjustable needle point, pen and pencil parts and lengthening bar.....
Box with reserve needle points.....
Combination Key and Leadbox.....
Per set $12.30

No. 1813PB, Same as No. 1813BL, but in Pocket Book Case with folding flaps. Per set..... 12.50

No. 1813CBL, Same as No. 1813BL, but with Center Wheel Bow Instruments Nos. 1762 and 1764 in lieu of Nos. 1752 and 1754. Per set 13.40

No. 1813CPB, Same as No. 1813PB, but with Center Wheel Bow Instruments Nos. 1762 and 1764 in lieu of Nos. 1752 and 1754. Per set 13.60

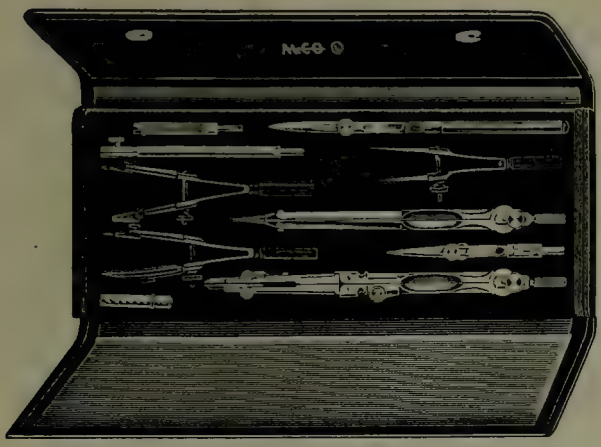
All Dividers and Compasses equipped with straightening device and patent clamp.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE L" DRAWING INSTRUMENTS

In Fine Morocco Cases

Each instrument stamped ~~ALCO~~ Ⓛ



No. 1823PB

No. 1823BL Bar Lock Case, velvet lined, containing:
No. 1702 Ruling Pen, 5½ in., slide catch opening.....
No. 1750 Steel Spring Bow Divider, 3¾ in.....
No. 1752 Steel Spring Bow Pen, 3¾ in. .....
No. 1754 Steel Spring Bow Pencil, 3¾ in. .....
No. 1780-2 Plain Divider, 6 in. .....
No. 1784¾ Compass, 6 in., adjustable needle point, pen and pencil parts and lengthening bar.....
Box with reserve needle points.....
Combination Key and Leadbox.....
Per set $13.50

No. 1823PB, Same as No. 1823BL, but in Pocket Book Case with folding flaps. Per set 13.75

No. 1823CBL, Same as No. 1823BL, but with Center Wheel Bow Instruments Nos. 1761, 1762 and 1764 in lieu of Nos. 1750, 1752 and 1754. Per set..... 15.25

No. 1823CPB, Same as No. 1823PB, but with Center Wheel Bow Instruments Nos. 1761, 1762 and 1764 in lieu of Nos. 1750, 1752 and 1754. Per set..... 15.50

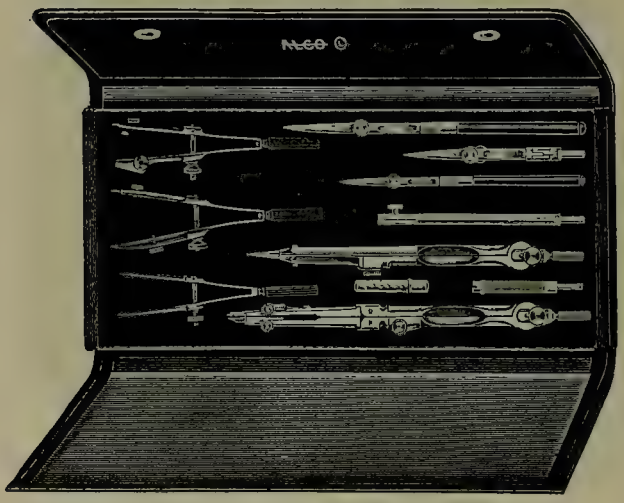
All Dividers and Compasses equipped with straightening device and patent clamp.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE L" DRAWING INSTRUMENTS

In Fine Morocco Cases

Each instrument stamped ~~ALCO~~ ©



No. 1824PB

No. 1824BL Bar Lock Case, velvet lined, containing:

No. 1700 Ruling Pen, 4½ in., slide catch opening.....
No. 1702 Ruling Pen, 5½ in., slide catch opening.....
No. 1750 Steel Spring Bow Divider, 3¾ in.....
No. 1752 Steel Spring Bow Pen, 3¾ in. .....
No. 1754 Steel Spring Bow Pencil, 3¾ in. .....
No. 1781 Hairspring Divider, 6 in.....
No. 1784¾ Compass, 6 in., adjustable needle point, pen and pencil parts and lengthening bar.....
Box with reserve needle points.....
Combination Key and Leadbox.....
Per set $15.25

No. 1824PB, Same as No. 1824BL, but in Pocket Book Case with folding flaps. Per set 15.50

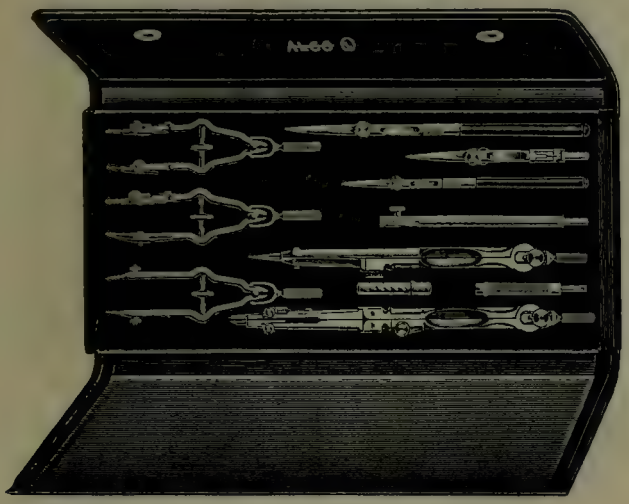
All Dividers and Compasses equipped with straightening device and patent clamp.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE L" DRAWING INSTRUMENTS

In Fine Morocco Cases

Each instrument stamped ~~ALCO~~ Ⓛ



No. 1825PB

No. 1825BL Bar Lock Case, velvet lined, containing:
- No. 1700 Ruling Pen, 4½ in., slide catch opening.....
- No. 1702 Ruling Pen, 5½ in., slide catch opening.....
- No. 1761 Bow Divider, center motion, 3½ in.....
- No. 1762 Bow Pen, center motion, 3½ in. .....
- No. 1764 Bow Pencil, center motion, 3½ in. .....
- No. 1781 Hairspring Divider, 6 in.....
- No. 1784¾ Compass, 6 in., adjustable needle point, pen and pencil parts and lengthening bar.....
- Box with reserve needle points .....
- Combination Key and Leadbox .....
- Per set $17.00

No. 1825PB, Same as No. 1825BL, but in Pocket Book Case with folding flaps. Per set 17.25

No. 1825PBCR, Same as No. 1825PB, but with (in addition):
- No. 1714 Curve Pen, 5½ in. .....
- No. 1715 Double Curve Pen, 5½ in. (Railroad Pen).....
- Per set 24.00

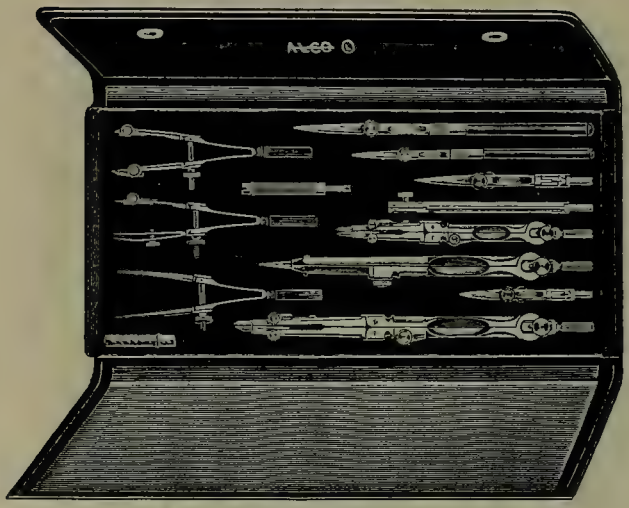
All Dividers and Compasses equipped with straightening device and patent clamp.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE L" DRAWING INSTRUMENTS

In Fine Morocco Cases

Each instrument stamped ~~ALCO~~ Ⓛ



No. 1826PB

No. 1826BL Bar Lock Case, velvet lined, containing:
- No. 1700 Ruling Pen, 4½ in., slide catch opening.....
- No. 1702 Ruling Pen, 5½ in., slide catch opening.....
- No. 1750 Steel Spring Bow Divider, 3¾ in.....
- No. 1752 Steel Spring Bow Pen, 3¾ in. .....
- No. 1754 Steel Spring Bow Pencil, 3¾ in. .....
- No. 1181 Hairspring Divider, 6 in. .....
- No. 1782½ Compass, 4¼ in., adjustable needle point, pen and pencil parts .....
- No. 1784¾ Compass, 6 in., adjustable needle point, pen and pencil parts and lengthening bar.....
- Box with reserve needle points.....
- Combination Key and Leadbox.....
- Per set $19.00

No. 1826PB, Same as No. 1826BL, but in Pocket Book Case with folding flaps. Per set 19.40

No. 1826CBL, Same as No. 1826BL, but with Center Wheel Bow Instruments Nos. 1761, 1762 and 1764 in lieu of Nos. 1750, 1752 and 1754. Per set 20.75

No. 1826CPB, Same as No. 1826PB, but with Center Wheel Bow Instruments Nos. 1761, 1762 and 1764 in lieu of Nos. 1750, 1752 and 1754. Per set 21.15

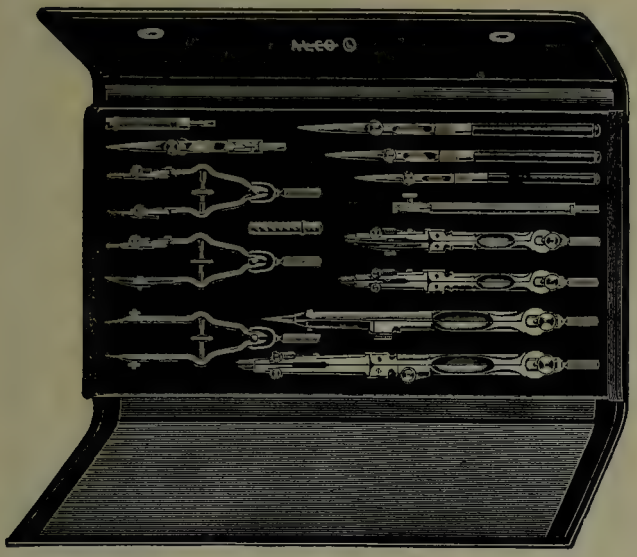
All Dividers and Compasses equipped with straightening device and patent clamp.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE L" DRAWING INSTRUMENTS

In Fine Morocco Cases

Each instrument stamped ~~ALCO~~ Ⓛ



No. 1827PB

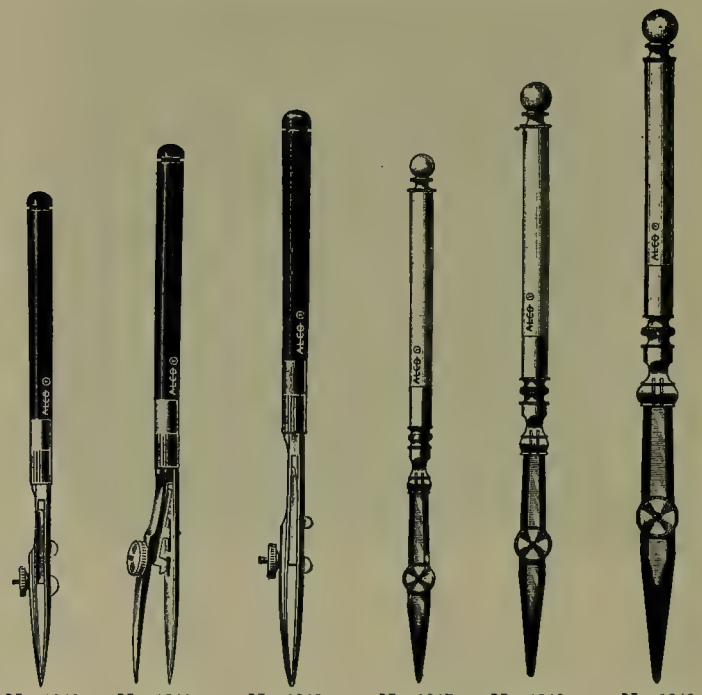
No. 1827PB Pocket Book Case with flaps, velvet lined, containing:
No. 1700 Ruling Pen, 4½ in., side catch opening.....
No. 1701 Ruling Pen, 5 in., slide catch opening.....
No. 1702 Ruling Pen, 5½ in., slide catch opening.....
No. 1761 Bow Divider, center motion, 3½ in.....
No. 1762 Bow Pen, center motion, 3½ in. .....
No. 1764 Bow Pencil, center motion, 3½ in. .....
No. 1781 Hairspring Divider, 6 in. .....
No. 1783A Compass, 4¼ in., adjustable needle point and pen part .....
No. 1783B Compass, 4¼ in., adjustable needle point and pencil part .....
No. 1784¾ Compass, 6 in., adjustable needle point and pen and pencil parts and lengthening bar.....
Box with reserve needle points.....
Combination Key and Leadbox .....
Per set $26.00

All Dividers and Compasses equipped with straightening device and patent clamp.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE T" DRAWING INSTRUMENTS

Each instrument stamped ~~ALCO~~ Ⓣ



No. 1840 No. 1841 No. 1842 No. 1847 No. 1848 No. 1849

No. 1840 Ruling Pen, 4½ in., slide catch opening, ebony handle....	$0.55
No. 1841 Ruling Pen, 5 in., slide catch opening, ebony handle....	.60
No. 1842 Ruling Pen, 5½ in., slide catch opening, ebony handle....	.65
No. 1847 Ruling Pen, 4½ in., with joint, ivory handle.....	.65
No. 1848 Ruling Pen, 5 in., with joint, ivory handle.....	.70
No. 1849 Ruling Pen, 5½ in., with joint, ivory handle.....	.75
No. 1847A Ruling Pen, 4½ in., with joint, aluminum handle.....	.65
No. 1848A Ruling Pen, 5 in., with joint, aluminum handle.....	.70
No. 1849A Ruling Pen, 5½ in., with joint, aluminum handle.....	.75

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE T" DRAWING INSTRUMENTS

Each instrument stamped ~~ALCO~~ Ⓣ

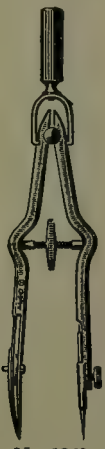
No. 1850

No. 1852

No. 1854

No. 1850 Steel Spring Bow Divider, German silver handle, 3½ in.	$0.80
No. 1852 Steel Spring Bow Pen, German silver handle, 3½ in.	1.10
No. 1854 Steel Spring Bow Pencil, German silver handle, 3½ in.	1.10
No. 1854C Set of 3 Steel Spring Bow Instruments Nos. 1850, 1852 and 1854, in morocco case	3.80

No. 1860



No. 1862

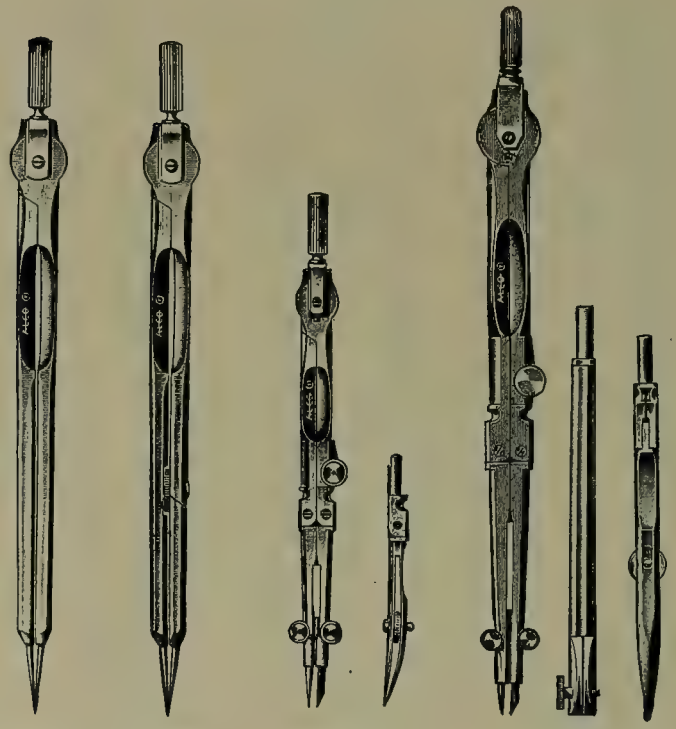
No. 1864

No. 1860 Bow Divider, new center adjustment, German silver handle and legs, 3½ in.	$0.95
No. 1862 Bow Pen, new center adjustment, German silver handle and legs, 3½ in.	1.25
No. 1864 Bow Pencil, new center adjustment, German silver handle and legs, 3½ in.	1.25
No. 1864C Set of 3 Bow Instruments Nos. 1760, 1762, and 1764, in morocco case	4.25

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE T" DRAWING INSTRUMENTS

Each instrument stamped ~~ALCO~~ Ⓣ



No. 1880-2 No. 1881 No. 1882½ No. 1884¾

No. 1880-2 Plain Divider, 6 in.	$1.10
No. 1881 Hairspring Divider, 6 in.	1.65
No. 1882½ Compass, 4¼ in., with fixed needle point, pen and pencil parts	2.25
No. 1884¾ Compass, 6 in., with fixed needle point, pen and pencil parts and lengthening bar	2.80

All Dividers and Compasses equipped with straightening device.

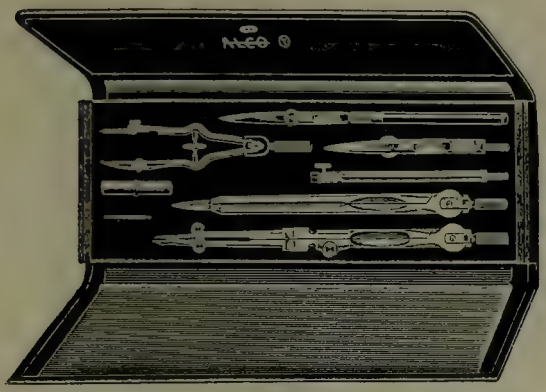
NOTE—For Catalog No. 1885, extra parts for ALCO "Circle T" Drawing Instruments, see page 360.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE T" DRAWING INSTRUMENTS

In Cases

Each instrument stamped ~~ALCO~~ Ⓣ



No. 1892CPB

No. 1890BL Bar Lock Case, velvet lined, containing:
No. 1842 Ruling Pen, 5½ in., slide catch opening.....
No. 1880-2 Plain Divider, 6 in. .....
No. 1884¾ Compass, 6 in., with fixed needle point, pen and pencil parts and lengthening bar.....
Box with Leads and Key .....
Per set $5.35

No. 1890PB, same as No. 1890BL but in Pocket Book Case with folding flaps. Per set..... 5.75

No. 1892BL, same as No. 1890BL but with (in addition) No. 1852 Steel Spring Bow Pen, 3½ in. Per set..... 6.60

No. 1892PB, same as No. 1892BL but in Pocket Book Case with folding flaps. Per set..... 7.00

No. 1892CBL, same as No. 1892BL but with Center Wheel Bow Instrument No. 1862 in lieu of No. 1852. Per set..... 6.75

No. 1892CPB, same as No. 1892PB but with Center Wheel Bow Instrument No. 1862 in lieu of No. 1852. Per set..... 7.15

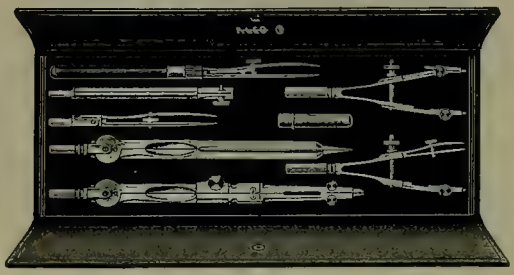
All Dividers and Compasses equipped with straightening device.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE T" DRAWING INSTRUMENTS

In Cases

Each instrument stamped ~~ALCO~~ Ⓣ



No. 1893PB

No. 1893BL Bar Lock Case, velvet lined, containing:
No. 1842 Ruling Pen, 5½ in., slide catch opening.....
No. 1852 Steel Spring Bow Pen, 3½ in. .....
No. 1854 Steel Spring Bow Pencil, 3½ in. ....
No. 1880-2 Plain Divider, 6 in. .....
No. 1884¾ Compass, 6 in., with fixed needle point, pen and pencil parts and lengthening bar.....
Box with Leads and Key .....
Per set $8.10

No. 1893PB, same as No. 1893BL but in Pocket Book Case with folding flaps. Per set..... 8.50

No. 1893CBL, same as No. 1893BL but with Center Wheel Bow Instruments Nos. 1862 and 1864 in lieu of Nos. 1852 and 1854. Per set 8.40

No. 1893CPB, same as No. 1893PB but with Center Wheel Bow Instruments Nos. 1862 and 1864 in lieu of Nos. 1852 and 1854. Per set 8.80

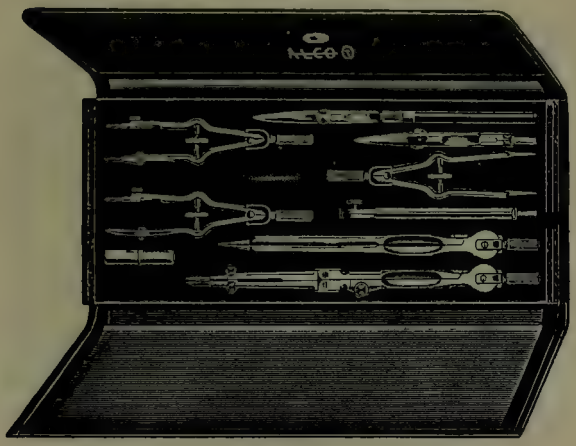
All Dividers and Compasses equipped with straightening device.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE T" DRAWING INSTRUMENTS

In Cases

Each instrument stamped ~~ALCO~~ Ⓣ



No. 1893-3CPB

No. 1893-3BL Bar Lock Case, velvet lined, containing:
No. 1842 Ruling Pen, 5½ in., slide catch opening.....
No. 1850 Steel Spring Bow Divider, 3½ in.....
No. 1852 Steel Spring Bow Pen, 3½ in. .....
No. 1854 Steel Spring Bow Pencil, 3½ in. .....
No. 1880-2 Plain Divider, 6 in.....
No. 1884¾ Compass, 6 in., with fixed needle point, pen and pencil parts and lengthening bar.....
Box with Leads and Key.....
Per set $8.80

No. 1893-3PB, same as No. 1893-3BL but in Pocket Book Case with folding flaps. Per set 9.20

No. 1893-3CBL, same as No. 1893-3BL but with Center Wheel Bow Instruments Nos. 1860, 1862 and 1864 in lieu of Nos. 1850, 1852 and 1854. Per set..... 9.25

No. 1893-3CPB, same as No. 1893-3PB but with Center Wheel Bow Instruments Nos. 1860, 1862 and 1864 in lieu of Nos. 1850, 1852 and 1854. Per set 9.65

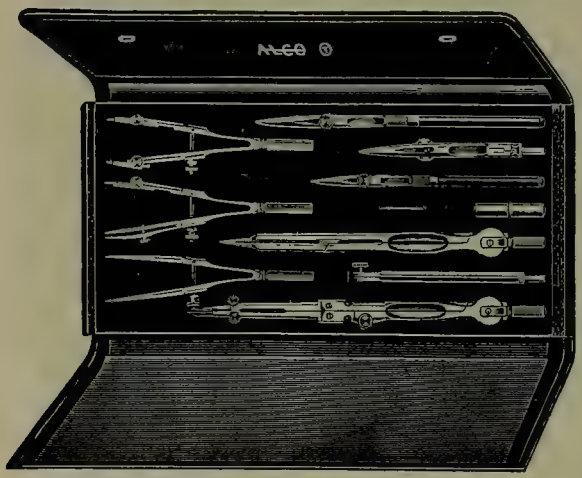
All Dividers and Compasses equipped with straightening device.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE T" DRAWING INSTRUMENTS

In Cases

Each instrument stamped ~~ALCO~~ Ⓣ



No. 1894PB

No. 1894BL Bar Lock Case, velvet lined, containing:
No. 1840 Ruling Pen, 4½ in., slide catch opening.....
No. 1842 Ruling Pen, 5½ in., slide catch opening.....
No. 1850 Steel Spring Bow Divider, 3½ in.....
No. 1852 Steel Spring Bow Pen, 3½ in. .....
No. 1854 Steel Spring Bow Pencil, 3½ in. ....
No. 1881 Hairspring Divider, 6 in. .....
No. 1884¾ Compass, 6 in., with fixed needle point, pen and pencil parts and lengthening bar.....
Box with Leads and Key .....
Per set $10.00

No. 1894PB, same as No. 1894BL but in Pocket Book Case with folding flaps. Per set 10.40

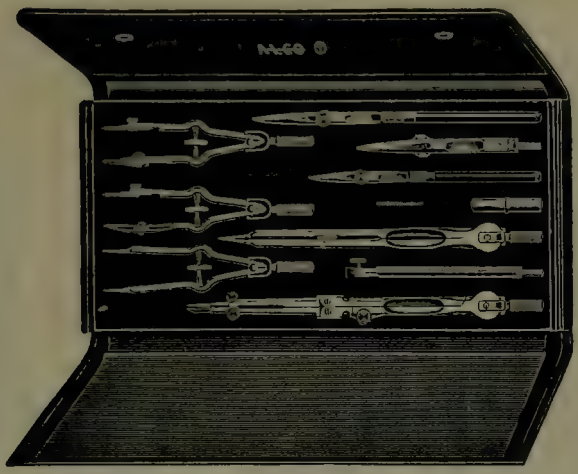
All Dividers and Compasses equipped with straightening device.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE T" DRAWING INSTRUMENTS

In Cases

Each instrument stamped ~~ALCO~~ Ⓣ



No. 1895PB

No. 1895BL Bar Lock Case, velvet lined, containing:
No. 1840 Ruling Pen, 4½ in., slide catch opening.....
No. 1842 Ruling Pen, 5½ in., slide catch opening.....
No. 1860 Bow Divider, center motion, 3½ in.....
No. 1862 Bow Pen, center motion, 3½ in. .....
No. 1864 Bow Pencil, center motion, 3½ in. .....
No. 1881 Hairspring Divider, 6 in. .....
No. 1884¾ Compass, 6 in., with fixed needle point, pen and pencil parts and lengthening bar.....
Box with Leads and Key .....
Per set $10.45

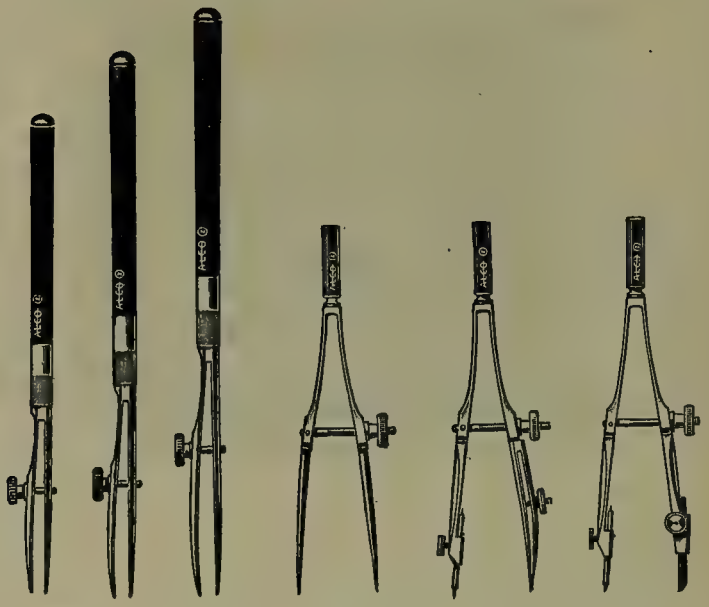
No. 1895PB, same as No. 1895BL but in Pocket Book Case with folding flaps. Per set 10.85

All Dividers and Compasses equipped with straightening device.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE Z" DRAWING INSTRUMENTS

Each instrument stamped ~~ALCO~~ Ⓩ



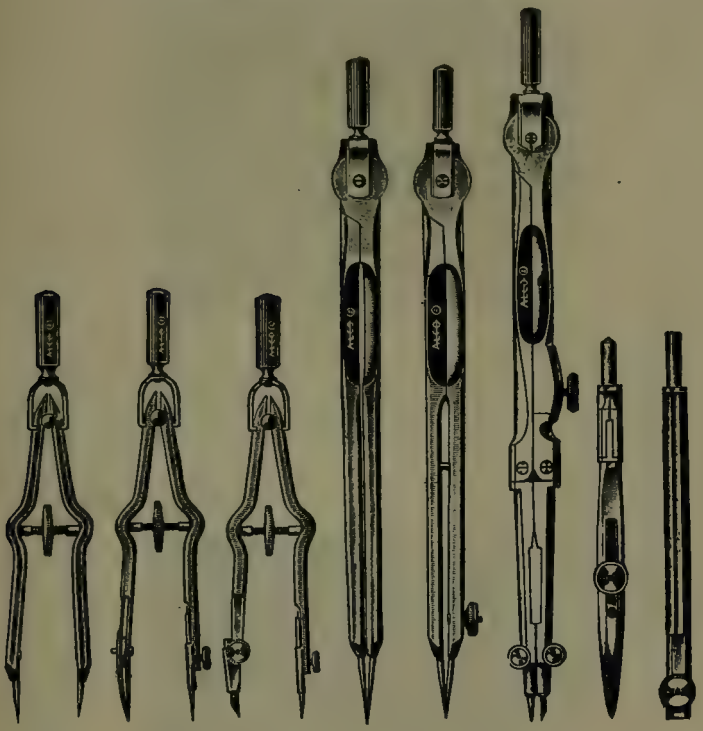
No. 1900 No. 1901 No. 1902 No. 1910 No. 1912 No. 1914

No. 1900	Ruling Pen, 4½ in., upper blade with spring, ebony handle	$0.50
No. 1901	Ruling Pen, 5 in., upper blade with spring, ebony handle	.55
No. 1902	Ruling Pen, 5½ in., upper blade with spring, ebony handle	.60
No. 1910	Steel Spring Bow Dividers, German silver handle, 3½ in...	.75
No. 1912	Steel Spring Bow Pen, German silver handle, 3½ in.....	.95
No. 1914	Steel Spring Bow Pencil, German silver handle, 3½ in.....	.95
No. 1914C	Set of 3 Steel Spring Bow Instruments, Nos. 1910, 1912 and 1914, in morocco case	3.25

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE Z" DRAWING INSTRUMENTS

Each instrument stamped ~~ALCO~~ Ⓩ



No. 1920 No. 1922 No. 1924 No. 1930-2 No. 1931 No. 1934¾

No. 1920 Bow Divider, new center adjustment, German silver handle and legs, 3½ in.	$0.75
No. 1922 Bow Pen, new center adjustment, German silver handle and legs, 3½ in.	.95
No. 1924 Bow Pencil, new center adjustment, German silver handle and legs, 3½ in.	.95
No. 1924C Set of 3 Bow Instruments, Nos. 1920, 1922 and 1924, in morocco case	3.25
No. 1930-2 Plain Divider, 6 in.	.75
No. 1931 Hairspring Divider, 6 in.	1.35
No. 1934¾ Compass, 6 in., with fixed needle point, pen and pencil parts and lengthening bar	1.90

All Dividers and Compasses equipped with straightening device.

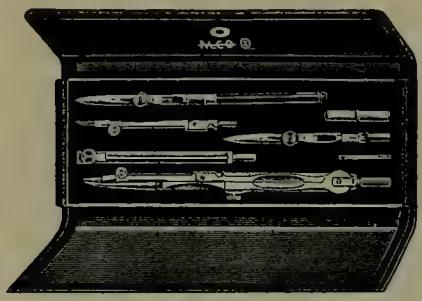
Spare parts for ALCO "CIRCLE Z" DRAWING INSTRUMENTS listed on page 360.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE Z" DRAWING INSTRUMENTS

In Cases

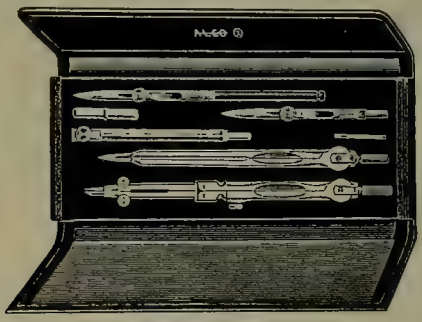
Each instrument stamped ~~ALCO~~ Ⓩ



No. 1939PB

No. 1939BL Bar Lock Case, velvet lined, containing:
No. 1902 Ruling Pen, 5½ in., ebony handle.....
No. 1934 Compass, 6 in., with fixed needle point, divider, pen and pencil parts and lengthening bar.....
Box with leads and key.....
Per set $3.00

No. 1939PB, same as No. 1939BL, but in Pocket Book Case with folding flaps. Per set 3.25



No. 1940PB

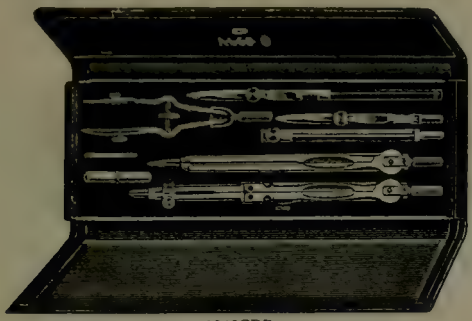
No. 1940BL Bar Lock Case, velvet lined, containing:
No. 1902 Ruling Pen, 5½ in., ebony handle.....
No. 1930-2 Plain Divider, 6 in. .....
No. 1934¾ Compass, 6 in., with fixed needle point, pen and pencil parts and lengthening bar.....
Box with leads and key.....
Per set $3.75

No. 1940PB, same as No. 1940BL, but in Pocket Book Case with folding flaps. Per set..... 4.00

All Dividers and Compasses equipped with straightening device.

ALCO "CIRCLE Z" DRAWING INSTRUMENTS

In cases. Each instrument stamped ALCO Ⓩ



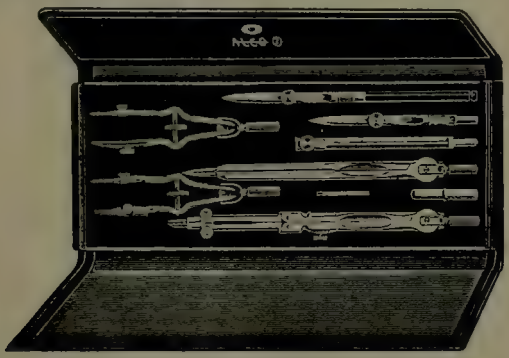
1942CPB

No. 1942BL Bar Lock Case, velvet lined, containing:
No. 1902 Ruling Pen, 5½ in., ebony handle
No. 1912 Steel Spring Bow Pen, 3½ in.
No. 1930-2 Plain Divider, 6 in.
No. 1934¾ Compass, 6 in., with fixed needle point, pen and pencil parts and lengthening bar
Box with Leads and Key. Per set $4.75

No. 1942PB, same as No. 1942BL but in Pocket Book Case with folding flaps. Per set 5.10

No. 1942CBL, same as No. 1942BL but with Center Wheel Bow Instrument No. 1922 in lieu of No. 1912. Per set 4.75

No. 1942CPB, same as No. 1942PB but with Center Wheel Bow Instrument No. 1922 in lieu of No. 1912. Per set 5.10



No. 1943CPB

No. 1943BL Bar Lock Case, velvet lined, containing:
No. 1902 Ruling Pen, 5½ in., ebony handle
No. 1912 Steel Spring Bow Pen, 3½ in.
No. 1914 Steel Spring Bow Pencil, 3½ in.
No. 1930-2 Plain Divider, 6 in.
No. 1934¾ Compass, 6 in., with fixed needle point, pen and pencil parts and lengthening bar
Box with Leads and Key. Per set $6.00

No. 1943PB, same as No. 1943BL but in Pocket Book Case with folding flaps. Per set 6.35

No. 1943CBL, same as No. 1943BL but with Center Wheel Bow Instruments Nos. 1922 and 1924 in lieu of Nos. 1912 and 1914. Per set 6.00

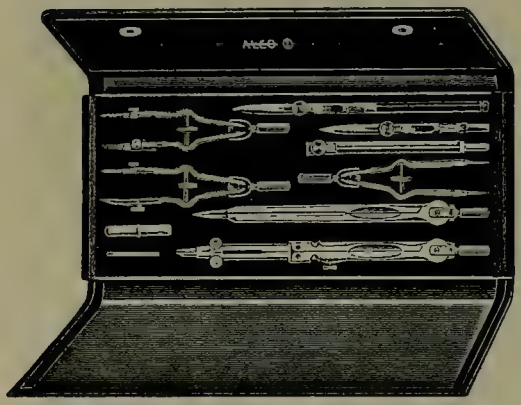
No. 1943CPB, same as No. 1943PB but with Center Wheel Bow Instruments Nos. 1922 and 1924 in lieu of Nos. 1912 and 1914. Per set 6.35

All Dividers and Compasses equipped with straightening device.

ALCO "CIRCLE Z" DRAWING INSTRUMENTS

In Cases

Each instrument stamped ~~ALCO~~ Ⓩ



No. 1943-3CPB

No. 1943-3BL Bar Lock Case, velvet lined, containing:
No. 1902 Ruling Pen, 5½ in., ebony handle.....
No. 1910 Steel Spring Bow Divider, 3½ in.....
No. 1912 Steel Spring Bow Pen, 3½ in. .....
No. 1914 Steel Spring Bow Pencil, 3½ in. .....
No. 1930-2 Plain Divider, 6 in. .....
No. 1934¾ Compass, 6 in., with fixed needle point, pen and pencil parts and lengthening bar.....
Box with Leads and Key.....
Per set $6.60

No. 1943-3PB, same as No. 1943-3BL but in Pocket Book Case with folding flaps. Per set 7.00

No. 1943-3CBL, same as No. 1943-3BL but with Center Wheel Bow Instruments Nos. 1920, 1922 and 1924 in lieu of Nos. 1910, 1912 and 1914. Per set 6.60

No. 1943-3CPB, same as No. 1943-3PB but with Center Wheel Bow Instruments Nos. 1920, 1922 and 1924 in lieu of Nos. 1910, 1912 and 1914. Per set 7.00

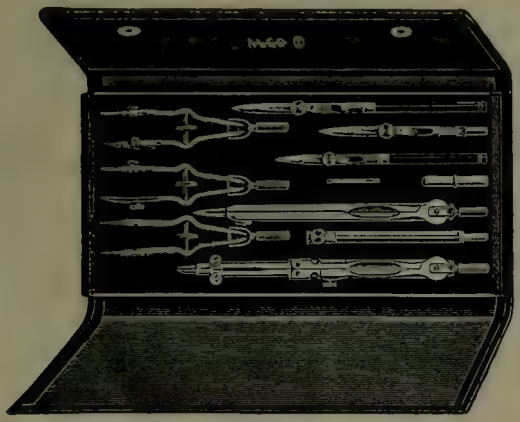
All Dividers and Compasses equipped with straightening device.

For prevailing prices see latest supplementary price list.

ALCO "CIRCLE Z" DRAWING INSTRUMENTS

In Cases

Each instrument stamped ~~ALCO~~ Ⓩ



No. 1945PB

No. 1944BL Bar Lock Case, velvet lined, containing:
- No. 1900 Ruling Pen, 4½ in., ebony handle.....
- No. 1902 Ruling Pen, 5½ in., ebony handle.....
- No. 1910 Steel Spring Bow Divider, 3½ in.....
- No. 1912 Steel Spring Bow Pen, 3½ in. .....
- No. 1914 Steel Spring Bow Pencil, 3½ in. .....
- No. 1931 Hairspring Divider, 6 in. .....
- No. 1934¾ Compass, 6 in., with fixed needle point, pen and pencil parts and lengthening bar.....
- Box with Leads and Key.....

Per set $7.60

No. 1944PB, same as No. 1944BL but in Pocket Book Case with folding flaps. Per set 8.00

No. 1945BL, same as No. 1944BL but with Center Wheel Bow Instruments Nos. 1920, 1922 and 1924 in lieu of Nos. 1910, 1912 and 1914. Per set 7.60

No. 1945PB, same as No. 1944PB but with Center Wheel Bow Instruments Nos. 1920, 1922 and 1924 in lieu of Nos. 1910, 1912 and 1914. Per set 8.00

All Dividers and Compasses equipped with straightening device.

For prevailing prices see latest supplementary price list.

EXTRA PARTS

For ALCO "CIRCLE L," ALCO "CIRCLE T" and ALCO "CIRCLE Z" Drawing Instruments.

No. 4 No. 5 No 6 No. 7 No. 13½

		No. 1785 For Alco "Circle L" Instruments	No. 1885 For Alco "Circle T" and "Circle Z" Instruments
No. 4	Combination Key and Leadbox	$0.25	$0.25
No. 5	Metal handle for needle, pen or pencil parts of small compasses	.40	.40
No. 6	Metal handle for parts of large compasses	.45	.40
No. 7	Center Tack	.15	.15
No. 8	Ebony handle for Ruling Pens	.15	.10
No. 9	Aluminum handle for Ruling Pens	.25	.15
No. 10	Ivory handle for Ruling Pens	.20	.20
No. 11	German silver handle for Bow Instruments	.25	.15
No. 13	Screws or bolt and nut for Pens	.25	.25
No. 13½	Slide catch device for Pens	.25	.25
No. 14	Bolts for Side Motion Bow Instruments	.25	.20
No. 15	Center Motion Screw with left and right thread	.35	.30
No. 17	Pencil part for No. 1767, etc.	.80	.75
No. 18	Pen part for No. 1767, etc.	.80	.75
No. 20	Divider or needle point part for No. 1782, etc.	1.00	.85
No. 21	Pencil part for No. 1782, etc.	1.00	.85
No. 22	Pen part for No. 1782, etc.	1.00	.85
No. 23	Divider or needle point part for No. 1784, etc.	1.25	1.00
No. 24	Pencil part for No. 1784, etc.	1.25	1.00
No. 25	Pen part for No. 1784, etc.	1.25	1.00
No. 26	Lengthening Bar for 4¼ in. Compasses.	1.00	.85
No. 27	Lengthening Bar for 6 in. Compasses	1.10	1.00

No. 1787 Tin Box containing 3 leads for instruments $0.10

For Needle Points, Horn Centers, etc., see bottom of page 288.

EMPTY CASES FOR DRAWING INSTRUMENTS

Illustrating Pocket Book (PB) Case.

Morocco Bar Lock or Pocket Book Cases, chamois or silk velvet lined

(As furnished with ALCO SUPERIOR KERN SWISS DRAWING INSTRUMENTS, ALCO "CIRCLE A" DRAWING INSTRUMENTS and ALCO "CIRCLE L" DRAWING INSTRUMENTS.)

Size of Case—	Bar Lock	Pocket Book
Up to and including 15 square inches	$2.00	$2.00
Over 15 sq. in. up to and including 24 sq. in.	2.50	2.50
Over 24 sq. in. up to and including 32 sq. in.	3.00	3.00
Over 32 sq. in. up to and including 45 sq. in.	3.50	3.50
Over 45 sq. in. up to and including 60 sq. in.	4.50	4.50
Over 60 sq. in. up to and including 80 sq. in.	5.00	5.00
Over 80 sq. in. up to and including 92 sq. in.	5.50	5.50

Bar Lock and Pocket Book Case, velvet lined

(As furnished with ALCO "CIRCLE T" and ALCO "CIRCLE Z" DRAWING INSTRUMENTS.)

Size of Case—	Bar Lock	Pocket Book
Up to and including 15 square inches	$1.30	$1.50
Over 15 sq. in. up to and including 24 sq. in.	1.75	2.00
Over 24 sq. in. up to and including 32 sq. in.	2.20	2.50
Over 32 sq. in. up to and including 45 sq. in.	2.50	2.90
Over 45 sq. in up to and including 60 sq. in.	3.60	4.00
Over 60 sq. in. up to and including 80 sq. in.	4.00	4.50
Over 80 sq. in. up to and including 92 sq. in.	4.50	5.00

Polished Wooden Cases with Lock and Tray

Made of thoroughly seasoned mahogany or black walnut, with silk velvet-lined tray for holding instruments and space under tray for triangles, water colors, brushes, etc. Hinges and lock nickel plated and German silver shield inlaid in cover.

Size of Tray—	Price Case Complete
Up to and including 36 square inches	$5.00
Over 36 sq. in. up to and including 45 sq. in.	5.75
Over 45 sq. in. up to and including 60 sq. in.	7.50
Over 60 sq. in. up to and including 80 sq. in.	8.75
Over 80 sq. in. up to and including 92 sq. in.	10.00
Over 92 sq. in. up to and including 140 sq. in.	14.00

We have every facility for manufacturing cases of any size or description. Estimates cheerfully furnished.

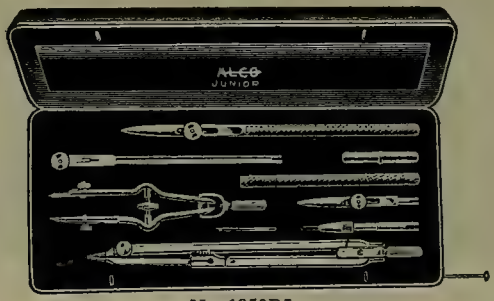
ALL ABOVE PRICES COVER FITTING OF THE INSTRUMENTS.

For prevailing prices see latest supplementary price list.

~~ALCO~~ "JUNIOR" DRAWING INSTRUMENTS

German Silver. Steel Points

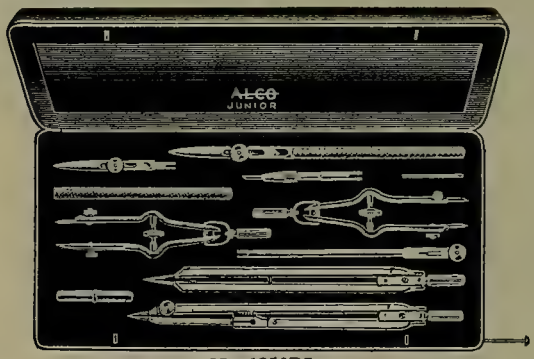
In Cases



No. 1950BL

No. 1950BL Barlock Case containing:

Ruling Pen, 5½ in., with release lever.....
Bow Ben, 3½ in., improved center motion.....
Compass, 5¾ in., with fixed needle point, divider, pen and pencil parts and lengthening bar.....
Metal Handle for parts of Compass.....
Key and Box of Leads. Per set..... $3.30



No. 1953BL

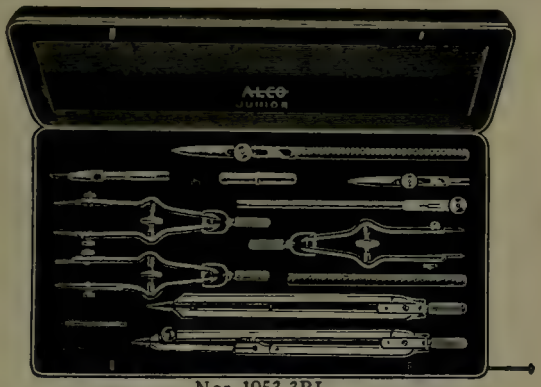
No. 1953BL Barlock Case containing:

Ruling Pen, 5½ in., with release lever.....
Bow Pen, 3½ in., improved center motion.....
Bow Pencil, 3½ in., improved center motion.....
Plain Divider, 5¾ in.....
Compass, 5¾ in., with fixed needle point, divider, pen and pencil parts and lengthening bar.....
Metal Handle for parts of Compass.....
Key and Box of Leads. Per set..... $4.90

Compasses and Dividers equipped with straightening device.

ALCO "JUNIOR" DRAWING INSTRUMENTS

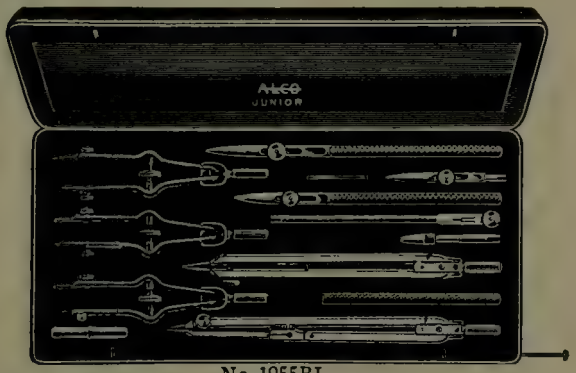
German Silver. Steel Points. In Cases



Nos. 1953-3BL

No. 1953-3BL Barlock Case containing:

Ruling Pen, 5½ in., with release lever
Bow Divider, 3½ in., improved center motion
Bow Pen, 3½ in., improved center motion
Bow Pencil, 3½ in., improved center motion
Plain Divider, 5¾ in.
Compass, 5¾ in., with fixed needle point, divider, pen and pencil parts and lengthening bar
Metal Handle for parts of Compass
Key and Box of Leads. Per set $5.35



No. 1955BL

No. 1955BL Barlock Case containing:

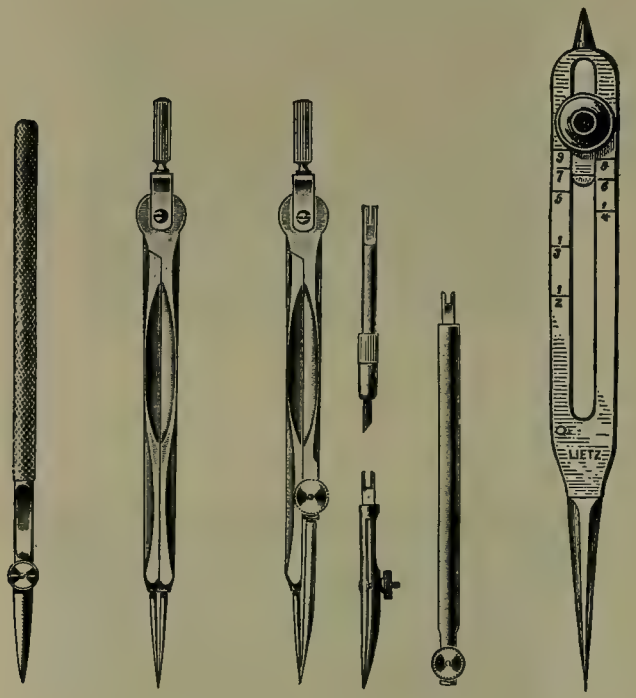
Ruling Pen, 4½ in., with release lever
Ruling Pen, 5½ in., with release lever
Bow Divider, 3½ in., improved center motion
Bow Pen, 3½ in., improved center motion
Bow Pencil, 3½ in., improved center motion
Hairspring Divider, 5¾ in.
Compass, 5¾ in., with fixed needle point, divider, pen and pencil parts and lengthening bar
Metal Handle for parts of Compass
Key and Box of Leads. Per set $6.15

Compasses and Dividers equipped with straightening device.

For prevailing prices see latest supplementary price list. *Page 363*

~~ALCO~~ "PREP" DRAWING INSTRUMENTS

German Silver. Steel Points



No. 1960 No. 1961 No. 1964 No. 1968

No. 1960	Ruling Pen, 5 in., metal handle	$0.15
No. 1961	Plain Divider, 5 in.	.40
No. 1964	Compass, 5 in., fixed needle point, divider, pen and pencil parts and lengthening bar	1.00
No. 1968	Brass Proportional Dividers, for lines, 6¼ in., in case	2.00
No. 1969	German Silver Proportional Dividers, for lines and circles, 6¼ in., in case	2.50

Compasses and Dividers equipped with straightening device.

For other Proportional Dividers see pages 289 and 333.

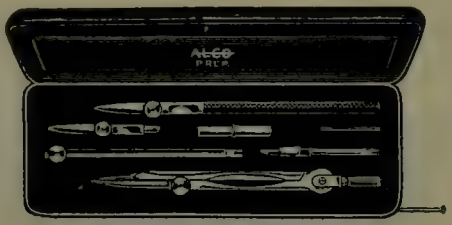
For prevailing prices see latest supplementary price list.

ALCO "PREP" DRAWING INSTRUMENTS

German Silver. Steel Points
In Cases

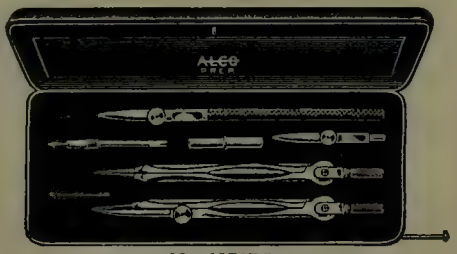
No. 1970BL

No. 1970BL Barlock Case containing:
Ruling Pen, 5 in., metal handle.....
Compass, 5 in., with fixed needle point, divider, pen and pencil parts .....
Key and Box of Leads. Per set..... $1.15



No. 1971BL

No. 1971BL, same as No. 1970BL but Compass with lengthening bar.
Per set $1.40



No. 1973BL

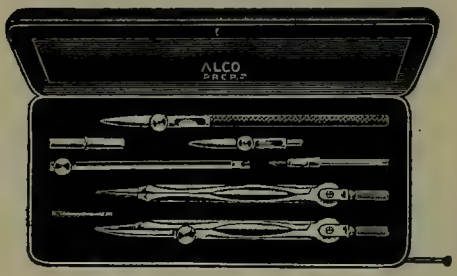
No. 1973BL Barlock Case containing:
Ruling Pen, 5 in., metal handle.....
Plain Divider, 5 in. .....
Compass, 5 in., with fixed needle point, divider, pen and pencil parts .....
Key and Box of Leads. Per set $1.45

All Compasses and Dividers have patent straightening device.

~~ALCO~~ "PREP" DRAWING INSTRUMENTS

German Silver. Steel Points

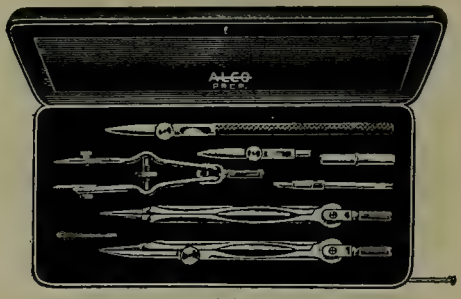
In Cases.



No. 1974BL

No. 1974BL Barlock Case containing:

Ruling Pen, 5 in., metal handle.....
Plain Divider, 5 in. .....
Compass, 5 in., with fixed needle point, divider, pen and pencil parts and lengthening bar.....
Key and Box of Leads. Per set..... $1.65



No. 1976BL

No. 1976BL Barlock Case containing:

Ruling Pen, 5 in., metal handle.....
Bow Pen, 3¼ in., improved center motion.....
Plain Divider, 5 in. .....
Compass, 5 in., with fixed needle point, divider, pen and pencil parts .....
Key and Box of Leads. Per set..... $2.25

All Compasses and Dividers have patent straightening device.

For prevailing prices see latest supplementary price list.

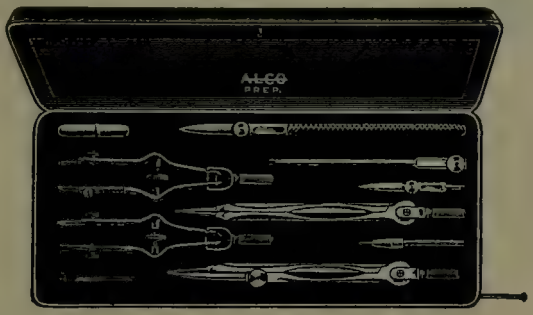
~~ALCO~~ "PREP" DRAWING INSTRUMENTS

German Silver. Steel Points

In Cases.

No. 1977BL

No. 1977BL, same as No. 1976BL, but Compass with lengthening bar.
Per set $2.50



No. 1978BL

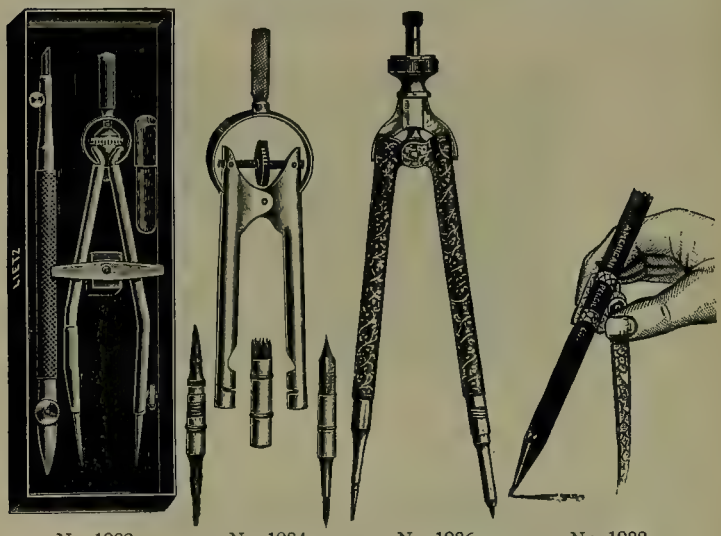
No. 1978BL Barlock Case containing:
Ruling Pen, 5 in., metal handle.....
Bow Pen, 3¼ in., improved center motion.....
Bow Pencil, 3¼ in., improved center motion.....
Plain Divider, 5 in. .....
Compass, 5 in., with fixed needle point leg, divider, pen and pencil parts and lengthening bar.....
Key and Box of Leads. Per set..... $3.45

No. 1979BL, same as No. 1978BL, but with (in addition) Bow Divider, 3¼ in., improved center motion. Per set..... 4.20

All Compasses and Dividers have patent straightening device.

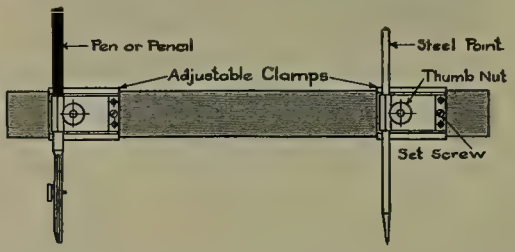
For prevailing prices see latest supplementary price list.

MISCELLANEOUS DRAWING COMPASSES



No. 1982 No. 1984 No. 1986 No. 1988

		Dozen	Each
No. 1982	"Elementary" Compass Set, consisting of adjustable bow Instrument, 4¼ in., with divider, pen and pencil parts, metal handle in which pen or pencil parts may be inserted for use as ordinary ruling pen or pencil and box of leads. In cardboard box	$5.00	$0.50
No. 1984	"American" Compass, 6 in., with interchangeable divider, pen and pencil points and box of leads. In cardboard box	3.00	.25
No. 1986	"Eagle" Compass, 5½ in., with interchangeable divider, pen and pencil points and box of leads. In cardboard box	3.00	.25
No. 1988	"Union" School Compass, No. 2 pencil fitted with adjustable steel point	1.20	.10



No. 1995

No. 1995 Beam Compass, 18 in., maple bar with two nickel-plated adjustable clamps and steel point $1.25

This Beam Compass is arranged for use with an ordinary ruling pen or pencil which is held in place by one of the adjustable metal clamps, the other holding the steel point.

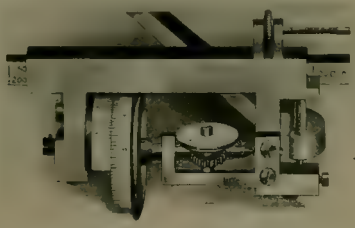
For prevailing prices see latest supplementary price list.

PLANIMETERS

This very useful instrument, for obtaining areas, is so well known to the engineer that it hardly need be described in particular. A theoretical discussion of the principles underlying its operation will be found in almost any handbook on higher surveying.

We submit the following instructions and examples for using these instruments:

INSTRUCTIONS FOR USING PLANIMETERS ARRANGED FOR MEASURING AREAS IN SQUARE INCHES (OR OTHER SINGLE UNITS ONLY)



Planimeters Nos. 2000 and 2001. (Illustrated on page 372)

With needle point **outside** the diagram. Put the instrument on the drawing surface, set the tracing point F at any mark on the outline of the area, then press the needle point E slightly into the paper outside the curve, and read off the roller D and the counting wheel G, taking the whole circumference of the recording roller as the unit of the reading (the roller need not be set to zero).

Readings. The drum of the roller is divided into 100 parts. The tenths of a part are read on the vernier. The complete turns of the roller are read on the counting disc, which advances one line at every complete turn. The counting disc performs one revolution at every 10 turns of the roller.

Each complete reading is a figure of 4 digits, the units being read on the counting disc, the tenths and hundredths on a drum, and the thousandths on the vernier.

The reading of the roller and disc, shown for example in the adjoining figure, is 5.343.

(The zero of the drum and a mark of the disc should simultaneously be opposite the fixed index mark. This is never exactly the case in consequence of the imperfection of the worm wheel gear, and this should be taken into account in making readings in the same way as with a watch, when the minute hand points to 12, while the hour hand fails to indicate the exact hour.)

Then move the tracing point F around the area in the direction of the movement of the hands of a watch till it reaches again the starting point. Now take another reading and subtract the first from the second reading. The difference multiplied by 10 will then be the area of the curve in square inches.

Example: To measure the area of a square of 4-inch sides.

Result: Second reading 3.073
first reading — 1.473

1.600 × 10 = 16 sq. ins.

PLANIMETERS

If the reading, before starting, had been 9.521 then the reading after circumscribing the same square as before would be 1.121. As the travel of the roller is in both cases the same, it is evident that the zero mark of the wheel has passed the fixed index mark and that, consequently, the second reading has now to be supplied with one more digit on the left before substracting the first reading. Thus

Complete second reading	11.121
first reading	— 9.521
	1.600 × 10 = 16 sq. ins.

With needle point **inside** the diagram. Circumscribe the diagram with the tracing point in the direction of the movement of the hands of a watch, watching at the same time the counter in order to see whether the total rotation of the roller is a forward or a back motion.

This preliminary rough operation being completed proceed as explained before, following the curve carefully with the tracing point. If the total rotation of the roller has been a forward motion, subtract the first from the second reading and add the difference to the figure engraved on the top of the small weight used for keeping the needle point in its place. The sum multiplied by 10 will then be the area of the curve in square inches.

Example: To measure a circle of 18 inches in diameter. (You will see that the total rotation of the roller is forward.)

Result:	Second reading	9.884
	first reading	— 0.868
		9.016
	Figure on weight	+ 16.431 (This figure varies slightly for different instruments.)
		25.447 × 10 = 254.47 sq. ins.

If the total rotation of the roller is a back motion, subtract the second from the first reading and subtract the difference from the figure on the weight.

Example: To measure a square of 11 inch sides. (You will see that the total rotation of the roller is backward.)

Result:	Complete first reading	13.009
	second reading	— 8.678
		4.331
	Figure on weight	16.431
	Difference of readings	— 4.331
		12.100 × 10 = 121 sq. ins.

NOTE.—When the mark o on the roller is at the mark o on the vernier a mark of the counting wheel should be opposite the fixed index mark. Any slight noncoincidence due to imperfection of worm wheel gear may readily be allowed for in taking readings.

The area corresponding to a total revolution of the roller—10 sq. ins. in the above example—is engraved on the weight along with the figure before mentioned.

INSTRUCTIONS FOR USING PLANIMETERS ARRANGED FOR MEASURING AREAS IN SEVERAL UNITS AND SCALES

Planimeters Nos. 2005-2010.

For illustrations see pages 372-373.

Set the index mark J on the beveled edge of the slide to a convenient division on the bar. There is a clamp and fine adjustment to get this position exactly. The number of units of area per unit of reading and the nature of unit or scale are marked to the right of each division.

PLANIMETERS

The divisions on the bar are the following:

on back		200 ac 6" = 1 mi	10 ac 1 : 2500 0.4 ac 1 : 500	5 ac 1 : 2500	
on top	20.811	20.818	21.042	22.107 22.122	
on front	100 □ cm	100 □' 3/8" = 1'	200 □' 1/4" = 1' 50 □' 1/2" = 1'	10 □ in	100 □' 1/4" = 1' 400 □' 1/8" = 1'

(The figures on the top of the bar vary slightly for different instruments. The denotation □' means square foot, □ cm = square centimeter, □ in = square inch, ac = acre, mi = mile.)

The slide being set on the bar, place the instrument upon the drawing and measure the diagram as with planimeter No. 2000.

Example: To measure a circle of 5 inches in diameter on a 1/4" plan.

Set the index mark J on the slide to the division 200 □' 1/4" = 1', press the needle point E outside the circle into the paper, set the tracing point F to any mark of the circle, read off the counter — the reading may be 1.322 — follow the circle with the tracing point until you arrive at the starting point and read again the counter. The reading will then become 2.893.

Result: Second reading 2.893
first reading — 1.322

1.571 × 200 = 314.2 sq. ft.

(The multiplier 200 is identical with the figure close to the right of the division used.)

For measuring small diagrams drawn on the 1/4" or 1/8" scale, the slide may conveniently be set to the last division on the bar marked 100 □' 1/4" = 1' 400 □' 1/8" = 1'.

If the needle point E be placed inside the diagram to be measured, then one of the figures on the top of the bar must be used in the same way as the figure on the weight of planimeter No. 2000.

Example: To measure a square of 12-inch sides on an ordinance map (scale 1 : 2500).

Set the index mark on the back of the slide to the division 10 ac 1 : 2500.

Suppose that the counter reads 2.482 before starting the tracing point.

In following the outline of the square you will see that the total rotation of the counter is backward and that the zero mark of the counting wheel passes the fixed index once.

Result: Complete first reading 12.482
second reading — 4.723

7.759

Figure on top of bar just over the division 22.107
difference of readings — 7.759

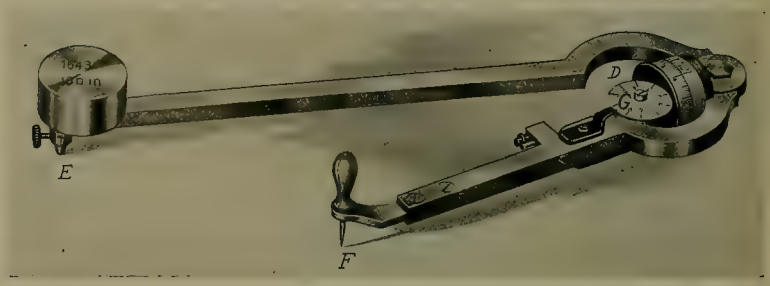
14.348 × 10 = 143.48 acres.

(The multiplier 10 is identical with the denotation 10 ac close to the right of the division used.)

PLANIMETERS NOS. 2015-2022

On these instruments the tracer arm is graduated, and settings can very accurately be made for any scale, either U. S. standard or foreign measurement, and allowances can be made for any shrinkage of the paper. The tracer arm also bears proportion marks for a number of scales for inches and metric measurements.

POLAR PLANIMETERS



No. 2000

No. 2000 Polar Planimeter, German silver, arranged for measuring areas in square inches.* Range: Circle, 18 in. in diameter. In neat velvet-lined case, with instructions. Each $16.50

No. 2001 Polar Planimeter, like No. 2000, but without recording wheel "G"..... 14.00

For instructions see page 369.

*On special order we can supply Planimeters Nos. 2000 and 2001 arranged for measuring areas in other single units.

No. 2005

No. 2005 Polar Planimeter, German silver, arranged for measuring areas in several units and scales. Range: Circle 24 in. in diameter. In neat velvet-lined case, with instructions. Each $25.00

No. 2006 Polar Planimeter, same as No. 2005 but larger. Range: Circle 42 in. in diameter. In neat velvet-lined case, with instructions. Each..... 35.00

POLE PLATE

Planimeters Nos. 2000, 2005, 2006, and 2010 can be furnished with a square pole plate in lieu of the needle point, which serves for rapidly setting the roller to zero without touching the rim of the measuring roller. Besides this the pole plate avoids pricking of the drawing or map by the needle point.

No. 2009 Extra charge for Pole Plate in lieu of needle point..... $1.50

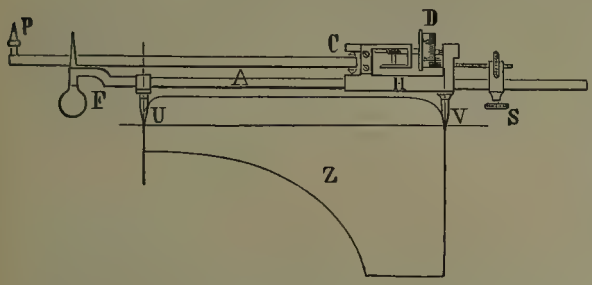
For prevailing prices see latest supplementary price list.

POLAR PLANIMETERS

No. 2010

No. 2010 Polar Planimeter, similar to No. 2005, but with special arrangement for rapidly finding the mean height of indicator diagrams (see explanation below). Range: Circle 25 in. in diameter; length of diagrams 2.8 in. In neat velvet-lined case, with instructions. Each $30.00

Arrangement for Finding the Mean Height of Indicator Diagrams



This arrangement consists of two steel points (protected by metal caps when not in use) as shown in the adjoining illustration, one attached to the top of the tracer arm, the other to the top of the carriage.

To obtain the mean height of the diagram, hold the instrument upside down, and by shifting the slide on the bar, adjust the two steel points so that they coincide exactly with the length of the diagram. Then place the planimeter without altering the relative position of slide and bar in the usual way upon the drawing—needle point outside the diagram—and follow the outline of the diagram with the tracing point. The difference of the readings at the beginning and at the end of the operation divided by 0.4 will be the mean height of the diagram, expressed in inches.

Example: Second reading 2.361
first reading — 1.913

0.4) 0.448 = 1.12 ins. = mean height.

If the diagrams for up and down stroke are measured jointly, divide by 0.8 instead of 0.4.

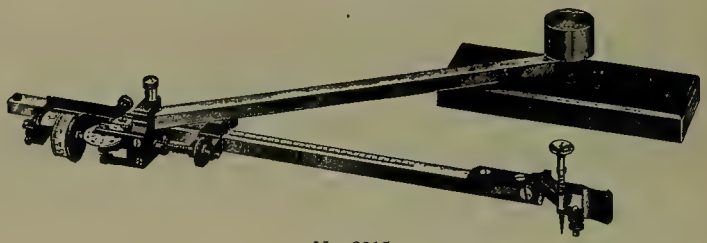
Mean pressure = Mean height × Scale of spring of indicator. Supposing the scale of the spring in the above example is 1″ = 80 lbs. per sq. in., then

$$\text{Mean pressure} = \frac{0.448 \times 80}{0.4} = 89.6 \text{ lbs. per sq. in.}$$

The number of pounds per inch of height being usually a multiple of 4, the arithmetical work is thus extremely simple.

For prevailing prices see latest supplementary price list.

POLAR PLANIMETERS



No. 2015

No. 2015 Polar Planimeter, German silver, tracer arm fully divided for settings in any scale, U. S. Standard or foreign, also bearing proportion marks for a number of scales for inches and metric measurements, fitted with clamp and tangent screw and ball pole instead of needle point, in morocco velvet-lined case. Each $33.00

No. 2016 Polar Planimeter like No. 2015 but with two steel points for finding the mean height of indicator diagrams, the points protected by screw caps, in morocco velvet-lined case. Each $35.50

Complete instructions with each instrument.

For prevailing prices see latest supplementary price list.

COMPENSATING PLANIMETERS

Compensating Planimeters Nos. 2020, 2021 and 2022 are in two separate parts: one is the tracer arm with measuring and recording wheels, the other the polar arm, having the pole weight at one end and a steel ball at the other, which forms a ball joint with the carriage. The ball joint cannot become loose or shaky, nor is it liable to be injured when adjusting the tracer arm or during shipment, as each part is stored in the case separately. This construction gives the tracer arm a motion of 180° in either direction, therefore the range of these instruments is much greater than that of the ordinary planimeters.

The pole is so constructed as to combine the advantages of the pole plate and the needle point, as the point need not be pressed into the paper and may be used for setting the roller to zero without touching the measuring roller.

By measuring a diagram with the pole on the right, and then on the left side of the tracer arm, and taking the mean of the readings all errors of the instrument are compensated.

COMPENSATING PLANIMETERS

No. 2020

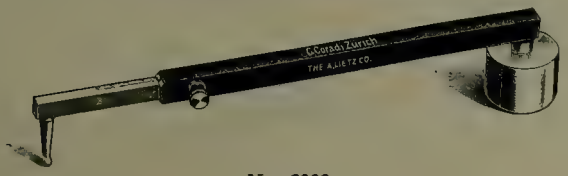
No. 2020 Compensating Planimeter, German silver and bronze, adjustable tracer arm with graduation from 270 to 350, improved pole weight, testing rule. In morocco velvet-lined case, with instructions. Each..... $23.50

No. 2021

No. 2021 Compensating Planimeter, German silver and bronze, adjustable tracer arm fully graduated for settings in any scale, and with proportion marks for a number of scales for inches and metric measurements. Fitted with clamp and tangent screw, improved pole weight, testing rule, in morocco velvet-lined case, with instructions. Each $34.00

No. 2022 Compensating Planimeter, like No. 2021, but with adjustable pole arm (see note below), in morocco velvet-lined case, with instructions. Each..... 41.00

THE ADJUSTABLE POLE ARM

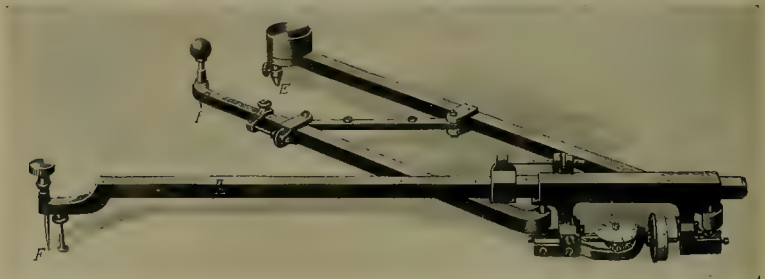


No. 2022

The adjustable pole arm, extending to about 13 inches, bears index marks for the different settings furnished with the instrument, and can be adjusted so that when the instrument is used with the pole inside of a figure, the constant is a round number, 20,000 for any setting. The instrument is used in the same way with the pole inside as with the pole outside, and by tracing the figure with the pole on the right and on the left of the tracer arm (about 13 inches) and taking the mean of the readings, large areas can be measured with great accuracy. The extensibility of the pole arm and the great range of the tracer arm permit of measuring very large figures with the pole outside. By reducing the length of the pole and tracer arms, the instrument can be used in a very small space.

For prevailing prices see latest supplementary price list.

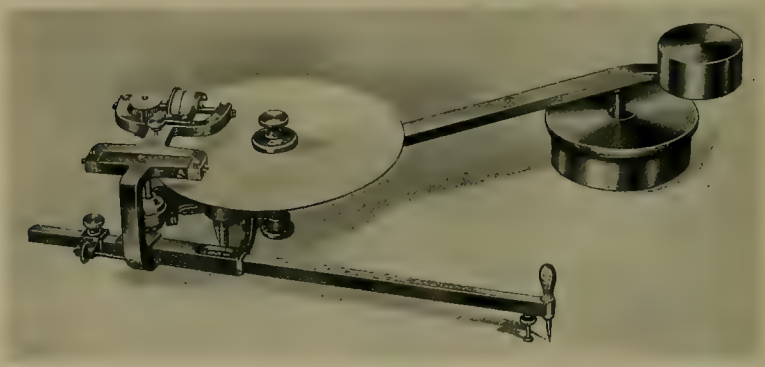
POLAR PLANIMETERS



No. 2025

No. 2025 Pantograph Polar Planimeter, German silver, with two adjustable tracer arms arranged for measuring areas in several units and scales. In neat velvet-lined case, with instructions. Each $65.00

Pantograph Polar Planimeter is particularly well adapted for measuring very large or very small areas. The long tracer arm has a range of a circle about 38″ in diameter. When using the long tracer arm it is advisable to remove the tracing point of the short arm, and the figure is traced in the usual manner. The short tracer arm is used for measuring very small areas. The tracing point is set on the figure, and the tracing point of the LONGER arm is so guided that the tracing point of the shorter arm follows the outline. As the two tracing points move alike, this is very easily manipulated. When using the short tracing arm in this manner the travel of the measuring wheel for the area is increased, in consequence of which the value of the wheel unit is smaller, and more accurate results are obtained.



No. 2028

No. 2028 Polar Disc Planimeter, German silver, adjustable tracer arm arranged for measuring areas in several units and scales. Range: Area enclosed between two concentric circles of 31 and 13 inches in diameter. In neat velvet-lined case. Each $75.00

The Polar Disc Planimeter is especially useful when figures are traced on paper that has been folded, rolled, etc., as the measuring wheel revolves on a plane disc instead of over the paper being traced. The paper on the disc can easily be renewed at any time by removing the screw nut on top of the disc. More accurate results are thus obtained when tracing on paper where the surface has in any manner been damaged.

For prevailing prices see latest supplementary price list.

POLAR PLANIMETERS

No. 2029

No. 2029 Polar Disc Planimeter, German silver and bronze, aluminum paper covered disc for measuring wheel, adjustable tracer arm fully divided for settings in any scale, with micrometer adjustment, adjustable for vernier unit from .003 sq. in. to .0008 sq. in. In morocco velvet-lined case, with testing rule and instructions. Each $82.50

ROLLING PLANIMETERS

No. 2030

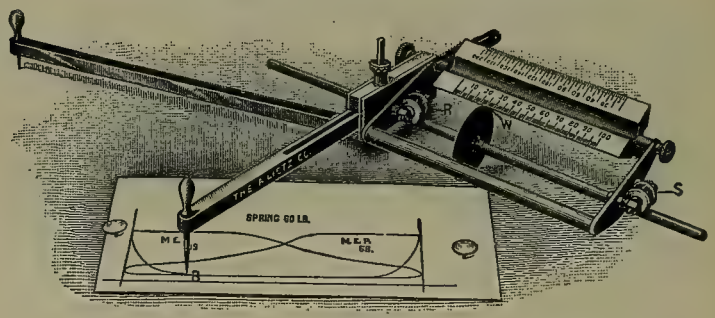
No. 2030 Precision Rolling Planimeter, German silver and bronze, adjustable tracer arm 10 inches long, fully graduated, with 8-in. telescoping extension. In morocco velvet-lined case, with testing rule, instructions. Each..... $75.00

No. 2031 Precision Rolling Planimeter, like No. 2030, but larger, tracer arm 12 inches long, with 10-in. telescoping extension. Each..... 90.00

The Precision Rolling Planimeters have an angular motion of about 90 degrees. The two rollers are made of exactly equal diameters, insuring a motion of the instrument, as a whole, in a straight line. The area of a figure of any length, the width of which does not exceed the length of the extended tracer arm, can be measured in one operation.

For prevailing prices see latest supplementary price list.

IMPROVED WILLIS PLANIMETER



No. 2035

No. 2035 Improved Willis Planimeter, in neat leather-covered case 1½x3½x9½, complete with instructions. Each..... $25.00

The Improved Willis Planimeter reads M. E. P. direct from indicator diagram, gives areas of regular or irregular circles or diagrams in square inches, feet and yards without any computation.

The usual planimeter has a recording wheel whose axle is parallel to the tracer bar. This wheel scrapes along the paper for all movements parallel to the tracer bar, and records by rotating all movements perpendicular to it. The instrument to which we call attention acts on an entirely different principle. The wheel (W) rolls for all movements parallel to the tracer bar and its steel spindle glides beneath roller for all perpendicular movements. After tracing a figure the result is read from the scale next to the wheel; this scale being triangular, has six graduated edges, any one of which can be brought next to the wheel, thus permitting reading to be taken in the unit best suited to the work.

The recording wheel of the improved Willis Planimeter is made of steel and has a sharp edge, which takes firm hold upon the paper or material upon which the instrument is operated, and the long steel shaft of this wheel glides freely beneath the rollers (R) and (S), which practically bear the weight of the instrument, and makes it absolutely frictionless. This construction gives great ease of movement, and the instrument is handled as readily on a rough table as on the finest paper. As the rotary movement is not registered, it is apparent that the accuracy of the instrument is not affected by the character of the paper or material upon which the instrument is operated, or by any slight reduction of the diameter of the wheel or injury to the knife edge. This is one of the most important points to be considered in the selection of a planimeter.

SCALES FOR INDICATOR DIAGRAMS

No. 2040 Flat Boxwood Scales 4 inches long, one edge beveled and divided.

	A	B	C	D	E	F	G	H	I	J	K
Parts to inch..	10	20	40	50	60	80	100	12	24	32	64
Each	$0 25	$0.25	$0.25	$0.25	$0.25	$0.35	$0.35	$0.25	$0.25	$0.25	$0.25

No. 2041 Set of 11 Scales, as listed above, in mahogany case..... $3.25

No. 2042 Triangular Boxwood Scales, 3 in., six edges divided:

A Indicator Scales, graduated 10, 20, 30, 40, 50, 60 parts to in.	Each....	$0.75
B Indicator Scales, graduated 20, 40, 50, 60, 80, 100 parts to in.	Each....	.75
C Indicator Scales, graduated 10, 15, 25, 30, 40, 70 parts to in.	Each....	.75
D Indicator Scales, graduated 10, 20, 25, 60, 80, 100 parts to in.	Each....	.75
E Indicator Scales, graduated 12, 24, 32, 64, 40, 60 parts to in.	Each....	.75

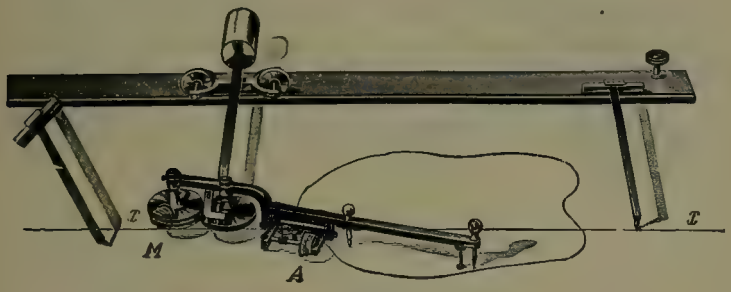
Indicator Scales with other graduations made to order.

For prevailing prices see latest supplementary price list.

MECHANICAL INTEGRATORS

With the aid of these instruments it is possible to ascertain the area and moments relative to an axis of any figure, by simply tracing its outline. They greatly facilitate the finding of the displacement, moments of stability and inertia, center of gravity, etc., of ships, the tensile strength, resistance, safe load, etc., of tracks, cables, beams, contents of embankments, etc. The readings are taken from the recording discs. These instruments are very simple, and can be used by anybody after a little practice.

AMSLER'S MECHANICAL INTEGRATOR



No. 2045

No. 2045 Amsler's Mechanical Integrator, German silver, with two recording mechanisms, giving the area and moment of any figure, two tracing points, grooved steel straightedge 29 in. long, in case, with instructions. Each..... $110.00

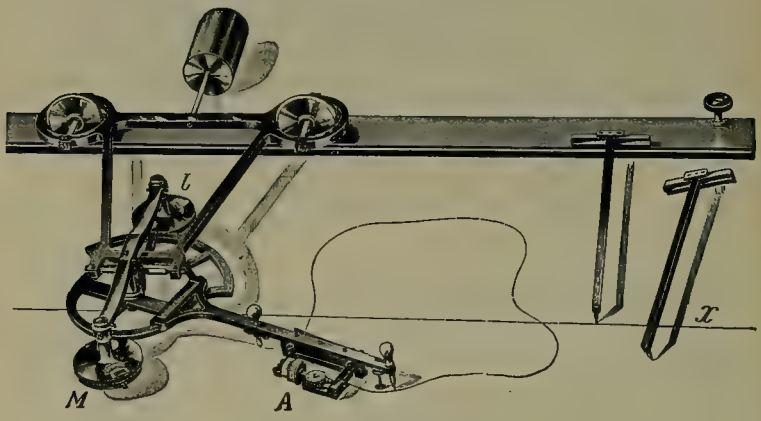
No. 2046 Amsler's Mechanical Integrator, same as No. 2045, but brass instead of German silver. Each..... 90.00

Grooved steel straightedges of other lengths to order.

Amsler's Mechanical Integrators Nos. 2045 and 2046 are provided with two tracing points, for large and small figures. When using the one nearest to the center of rotation of the instrument, the travel of the measuring wheel is increased, as a consequence the area value of the wheel unit is smaller, and more accurate results are obtained. Very large figures can be measured in sections. By means of a formula furnished with each instrument, area and moment of figures drawn to scale can easily be obtained.

For prevailing prices see latest supplementary price list.

MECHANICAL INTEGRATORS



No. 2050

No. 2050 Amsler's Mechanical Integrator, with three recording mechanisms, giving the area, moment and moment of inertia of any figure; German silver, two tracing points, two gauges for adjusting instrument to axis of moments, instrument in walnut case; grooved steel rail, 59 inches, in separate hardwood case, with instructions. Each..... $175.00

No. 2051 Amsler's Mechanical Integrator, same as No. 2050, but brass instead of German silver. Each..... 145.00

No. 2052 Amsler's Mechanical Integrator, German silver, like No. 2050 but larger, three tracing points, and grooved steel rail 78 inches long. Each 265.00

No. 2053 Amsler's Mechanical Integrator, same as No. 2052, but brass instead of German silver. Each..... 215.00

Grooved Steel Rails of other lengths to order.

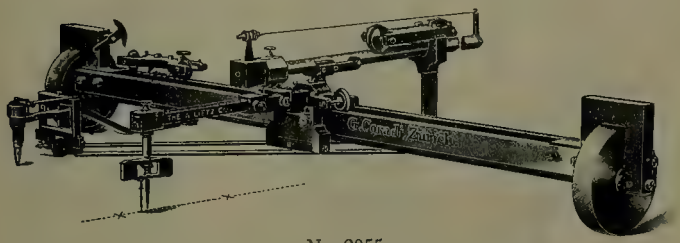
For prevailing prices see latest supplementary price list.

THE MECHANICAL INTEGRAPH

The Integraph is an integrator which not only indicates the final result of the integration, but also gives a graphic representation thereof. While the tracer travels around the outline of the figure, the integraph automatically draws an integral curve the ordinates of which are proportionate to the area of the figure traveled around ($y_1 = \int y.\, dx$). If this first integral curve is traced by the tracer of the integraph as a differential curve, the tracer draws a second integral curve the ordinates of which are proportional to the moment of stability ($y_2 = \int y^2\, dx$). By tracing this second integral curve we obtain a third integral curve the ordinates of which are proportional to the moment of inertia ($y_3 = \int y^3\, dx$) etc. The y-axis for the moments can be chosen anywhere on the curve, i. e., it can be shifted. By means of the integraph many of the most difficult calculations and problems occurring in the practice of an engineer can be solved in a simple and reliable manner and with much saving of time and the operator need not possess any knowledge of higher mathematics.

The applications of the integraph are very numerous. With it we calculate areas, divide areas, determine centers of gravity, calculate moments of stability, load and resistance, solve algebraical equations, etc.

CORADI'S MECHANICAL INTEGRAPH



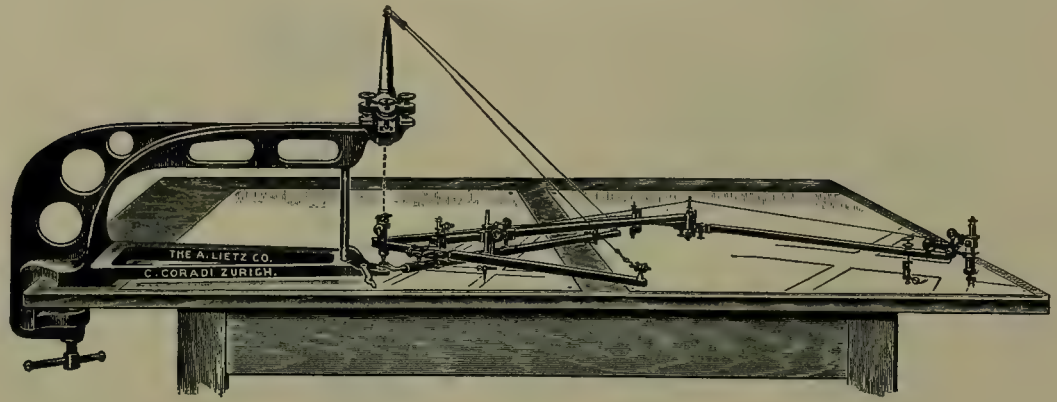
No. 2055

No. 2055 Coradi's Mechanical Integraph, German silver and bronze, tracer arm graduated to 1/10 inches with vernier reading to 1/100 inches with micrometer screw. Instrument complete in case with testing rule, instructions. Each..... $200.00

Coradi's Mechanical Integraph moves on two broad rollers. The carriages of the tracing and integrating points have a lateral travel of 10.3 inches. The base can be set from 1.5 to 5.2 inches.

For prevailing prices see latest supplementary price list.

PRECISION PANTOGRAPHS



No. 2070

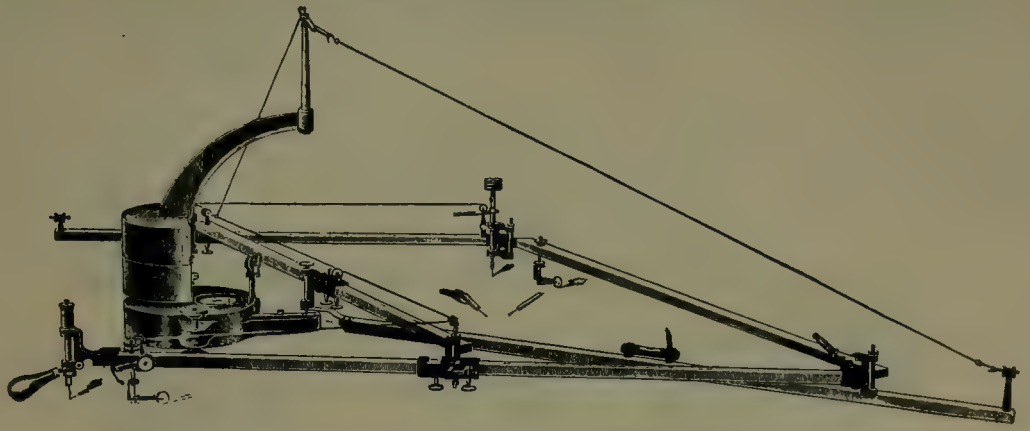
FOR ENLARGING FROM 1:1 TO 1:20 AND REDUCING FROM 20:1 TO 1:1, IN ALL RATIOS

No. 2070 Suspended Precision Pantograph, square metal bars 24 in. long, graduated throughout, with vernier and micrometer adjustments, large adjustable clamping standard, which may be raised and the drawing slipped under the base. Instrument complete with all usual accessories, in polished box with lock and key. Each $180.00

No. 2071 Do., but length of bars 38 in..... 210.00

For prevailing prices see latest supplementary price list.

PRECISION PANTOGRAPHS



No. 2075

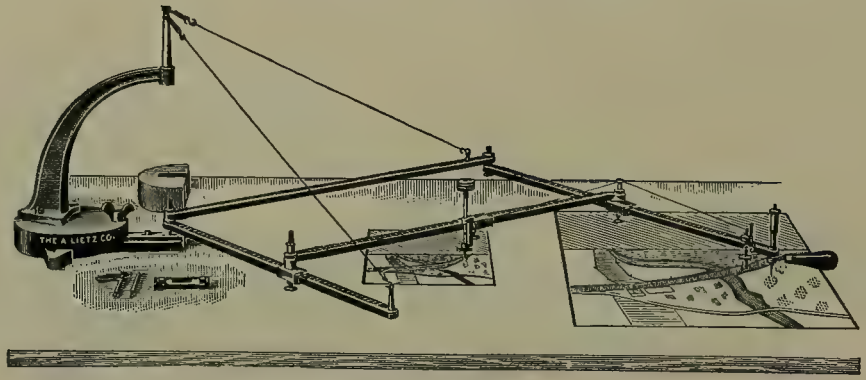
FOR ENLARGING FROM 1:1 TO 1:20 AND REDUCING FROM 20:1 TO 1:1, IN ALL RATIOS

No. 2075 Suspended Precision Pantograph, square metal bars 33 in. long, graduated throughout, with vernier and micrometer adjustments, extra supporting bar and appliances for setting up instrument with the pole within the parallelogram, for reproducing in the size of the original. Instrument complete with all usual accessories, in polished box with lock and key. Each $160.00

No. 2076 Do., but length of bars 38 in. 170 00

For prevailing prices see latest supplementary price list.

SUSPENDED PANTOGRAPHS



No. 2080

FOR ENLARGING FROM 1:20 TO 4:5 AND REDUCING FROM 20:1 TO 5:4, IN ALL RATIOS

No. 2080 Suspended Pantograph, square metal bars 28 in. long, graduated throughout, sliding sockets with beveled edges to facilitate the reading of ratios. Instrument complete with all usual accessories, in polished box with lock and key. Each $75.00

No. 2081 Do., but length of bars 33 in. 85.00

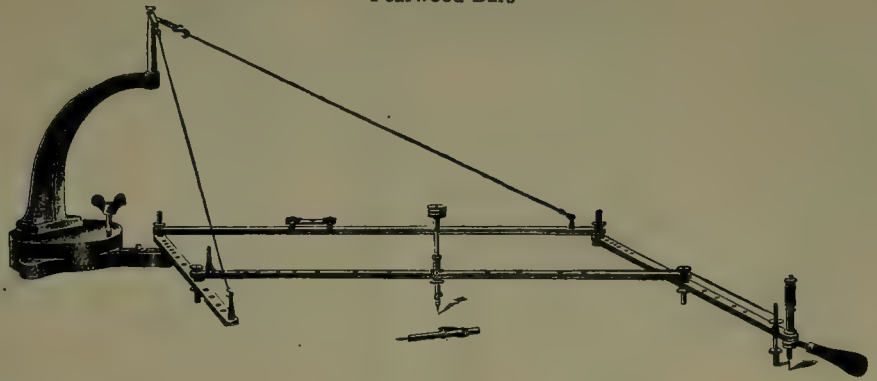
No. 2082 Do., but length of bars 38 in. 92.50

Pantographs Nos. 2070 to 2082 are furnished with a Tracing Point, a Dotting Needle, a Lead Pencil Slide and a Reverse Dotting Needle; 3 or 4 Brass Weights to weigh down the needle and lead pencil; a small Set Level and Instructions for use. The joints run on cone-shaped steel pivots, to assure an accurate and easy movement.

For prevailing prices see latest supplementary price list.

SUSPENDED PANTOGRAPHS

Pearwood Bars



No. 2085

FOR ENLARGING AND REDUCING IN THE FOLLOWING RATIOS:
1:20, 1:10, 1:8, 1:6, 1:5, 1:4, 1:3, 2:5, 1:2, 3:5, 2:3, 3:4, 4:5, AND VICE VERSA

No. 2085 Suspended Pantograph, strong pearwood bars, 28 in. long, made of well seasoned material, with holes accurately spaced for the above ratios. Instrument complete with all usual accessories, in polished box with lock and key. Each $35.00

No. 2086 Do., but length of bars 33 in. 36.00

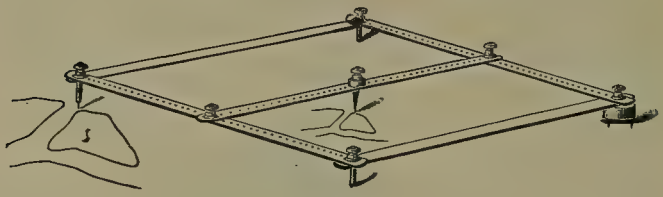
No. 2087 Do., but length of bars 38 in. 37.50

Pantographs Nos. 2085 to 2087 are furnished with a Tracing Point, Steel Point, Pencil Point, 3 Brass Weights to weigh down needle, and Box of Leads.

The joints are made of polished steel cones in metal sockets to assure an accurate and easy movement.

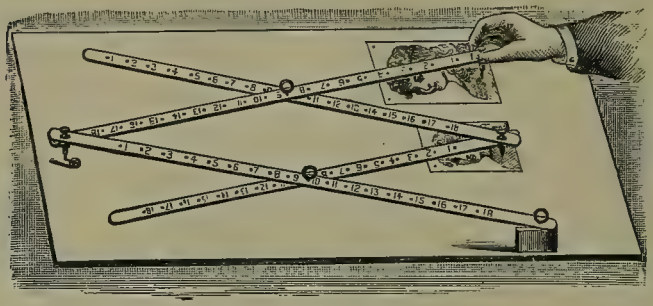
For prevailing prices see latest supplementary price list.

WOODEN PANTOGRAPHS



No. 2090

No. 2090 Pantograph of polished hardwood, bars 22½ in. long, for reducing and enlarging drawings from 2:1 to 16:1 or vice versa, in box with directions. Each $3.50



No. 2092

No. 2092 Pantograph of polished hardwood, bars, 21 in. long, for reducing and enlarging drawings from 8:1 to 1⅛:1 or vice versa, with nickel-plated screw-eye joints and elbow-wheel, in box with directions. Each $2.50

No. 2093, same as No. 2092, but brass instead of nickel-plated mountings, in box with directions. Each 2.00

No. 2094, same as No. 2093, but wood not polished. Each 1.50

No. 2095, same as No. 2094, but movable point at elbow instead of wheel; in box with directions. Each 1.00

No. 2096 Pantograph, hardwood not polished, with neat and substantial trimmings. Ea. .50

No. 2097 Pantograph, small, for school purposes. Each ..... .25

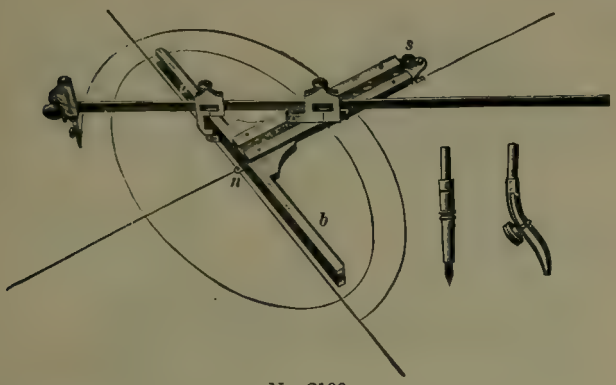
HARDWOOD PANTOGRAPH

High Quality.

No. 2099 Pantograph of polished inlaid hardwood, bars 41 in. long, for reducing and enlarging drawings from 8:1 to 1⅛:1 or vice versa, with nickel-plated joints comprised of bolts and thumbnuts, and metal foot; in box with directions. Each $5.00

For prevailing prices see latest supplementary price list.

ELLIPSOGRAPH AND BEAM COMPASS COMBINED



No. 2100

No. 2100 Ellipsograph and Beam Compass combined, complete, in case..... $25.00

With the aid of this instrument circles and ellipses, from ⅜ in. to 22 in. major diameter may be drawn. Complete instructions accompany each instrument.

CAMERA LUCIDA

Nos. 2101A-C

The Camera Lucida shows clearly and at the same time both the pencil point and the object reflected on the paper with full details, lights, shades and colors so that the most difficult subject may be drawn without any previous knowledge of drawing. The application of this instrument is unlimited. Photographs can be reduced or enlarged. Reversed drawings can be accomplished with a great saving of time. Landscapes can be sketched in a few minutes and the time of posing of the living model considerably shortened. It is especially valuable to artist and draftsman, who can space out correctly the most complicated perspective or foreshortenings.

No. 2101A Camera Lucida with double extension bar, hinged prism, two-colored glasses for modifying the light, and clamp to attach to edge of table. In morocco case $13.50

No. 2101B Camera Lucida, similar to No. 2101A, but with extra large prism allowing of greater illumination, double extension bar operated by rack and pinion, four lenses for enlargement and reduction of the image, and improved clamp for attaching to edge of table. In morocco case..... 25.00

No. 2101C Camera Lucida, with extra large silvered prism allowing of greater illumination and twice the angle of view of the other models. Will enlarge or reduce up to a maximum of 36 times. Double extension bar operated by rack and pinion, 12 lenses for enlargement and reduction of the image, and improved clamp for attaching to edge of table. In morocco case..... 50.00

Complete instructions are furnished with each Camera Lucida.

For prevailing prices see latest supplementary price list.

MAP MEASURES

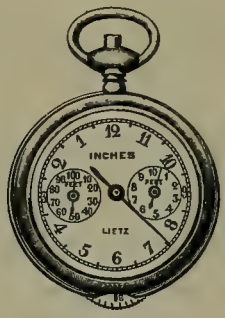
For measuring curved or straight lines.

No. 2103

No. 2103 Map Measure, 1⅛ in. dial, fixed metal handle, with two graduations: inches to miles and centimeters to kilometers $2.75

No. 2104

No. 2104 Map Measure, same as No. 2103, but with swiveling metal handle..... $3.00



No. 2105

No. 2106-7

No. 2105 Map Measure, watch pattern, 1¾ in. diameter, three dials, registering 100 feet in feet, inches and eighths, with zero setting device..... $4.50

No. 2106 Map Measure, watch pattern, 1 in. dial registering 25 feet in single feet, inches and eighths 1.75

No. 2107 Map Measure, same as No. 2105 but 1¼ in. dial..... 2.00

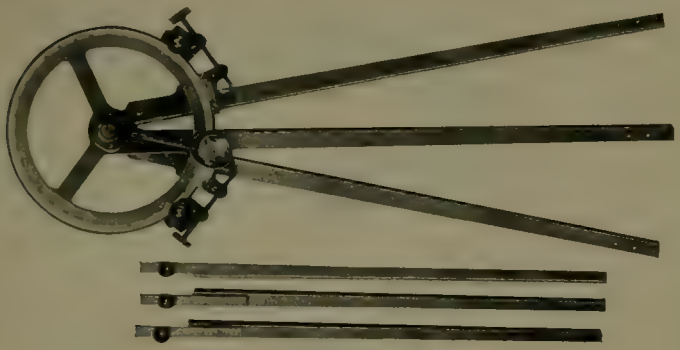
To measure a line the instrument should be set to zero. The projecting wheel is then run along the line in one direction, the index hands indicating the length of line in feet, inches and eighths.

For prevailing prices see latest supplementary price list.

~~ALCO~~ SUPERIOR PROTRACTORS

Three-Arm Protractor or Station Pointer

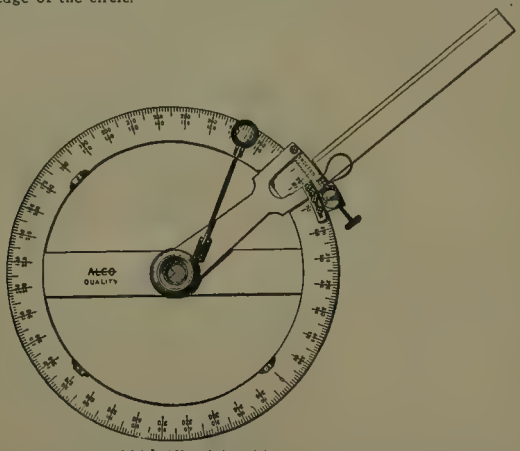
As made by us for the U. S. Navy Department.



No. 2110

No. 2110 Three-Arm Protractor or Station Pointer, in polished mahogany box, complete. Each $90.00

Lietz Three-Arm Protractor No. 2110 is divided on solid silver to half degrees and numbered in opposite directions from 0 to 360, with two verniers reading to single minutes. Both verniers with tangent screw. Size of circle 6½ inches. Magnifying glass on swinging arm. Three arms made of German silver, each 17 inches long with extension pieces to lengthen to 27½ inches beyond the edge of the circle.



Nos. 2116-17 with 2118

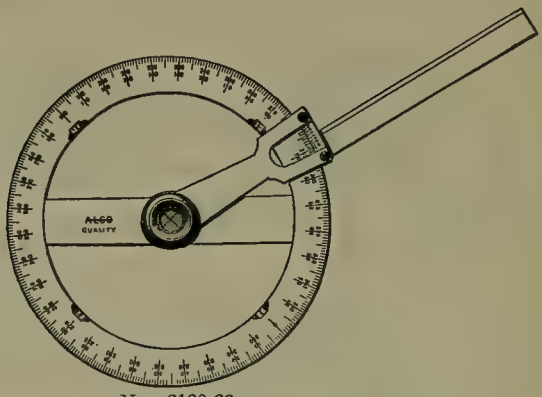
No. 2116 Circular German Silver Protractor, 8 in., *with clamp screw and micrometer to vernier*, with horn center and movable arm 6 in. long, divided to ¼ degrees, vernier reading to 1 minute. Each..... $20.00

No. 2117, same as No. 2116 but 10 in. and movable arm 6½ in. long. Each..... 24.00

No. 2118 Attached Reading Glass on swinging arm for Protractors Nos. 2116, 2117, 2128 and 2129 ..... 4.00

For Morocco Cases for the above Protractors see bottom of page 390.

~~ALCO~~ SUPERIOR PROTRACTORS



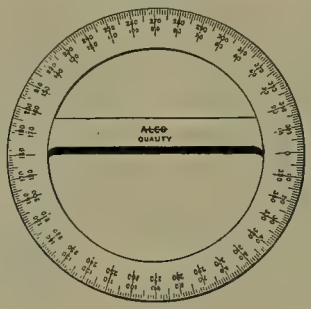
Nos. 2120-22

No. 2120 Circular German Silver Protractor, 5½ in., with horn center and movable arm 5½ in. long, divided to ½ degrees, vernier reading to 3 minutes. Each $14.00

No. 2121, same as No. 2120 but 8 in. and movable arm 6 in. long, divided to ¼ degrees, vernier reading to 1 minute. Each 16.00

No. 2122, same as No. 2120 but 10 in. and movable arm 6½ in. long, divided to ¼ degrees, vernier reading to 1 minute. Each 20.00

For Morocco Cases for the above Protractors see bottom of page.



No. 2125

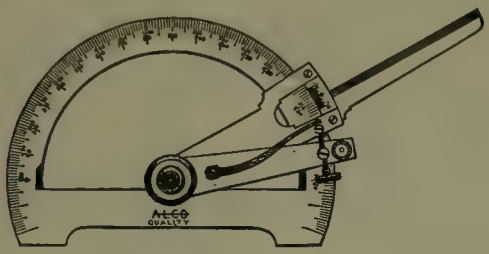
No. 2125 Circular German Silver Protractor, 5 in., beveled edge, divided to ½ degrees. Each $5.50

MOROCCO CASES FOR CIRCULAR ARM PROTRACTORS

Morocco Case for No. 2120. Each $4.50
Morocco Case for No. 2116 or 2121. Each 4.50
Morocco Case for No. 2117 or 2122. Each 5.00

For prevailing prices see latest supplementary price list.

ALCO SUPERIOR PROTRACTORS

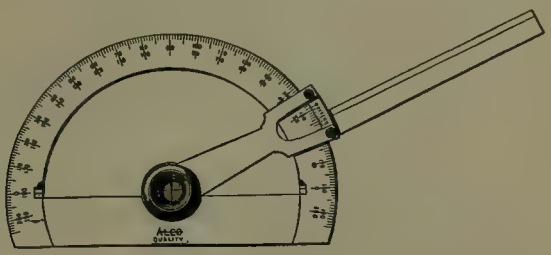


Nos. 2128-29

No. 2128 Semicircular German silver Protractor, 8 in., *with clamp screw and micrometer to vernier,* horn center, and movable arm 6 in. long, divided to ¼ deg., vernier reading to 1 minute. Each..... $18.00

No. 2129, same as No. 2128, but 10 in., and movable arm 6½ in. long. Each..... 21.00

No. 2118 Attached Reading Glass on swinging arm for Protractors Nos. 2128 and 2129 4.00



Nos. 2135-37

No. 2135 Semicircular German silver Protractor, 5½ in., with horn center, and movable arm 5½ in. long, divided to ½ deg., vernier reading to 3 minutes. Each $10.00

No. 2136, same as No. 2135, but 8 in., and movable arm 6 in. long, divided to ¼ deg., vernier reading to 1 minute. Each..... 14.00

No. 2137, same as No. 2135, but 10 in., and movable arm 6½ in. long, divided to ¼ deg., vernier reading to 1 minute. Each..... 17.00

MOROCCO CASES FOR SEMICIRCULAR ARM PROTRACTORS

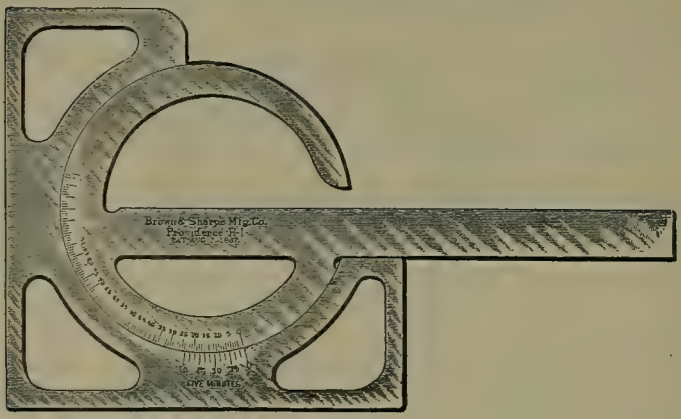
Morocco Case for No. 2135. Each $3.75

Morocco Case for No. 2128 or No. 2136. Each 3.75

Morocco Case for No. 2129 or No. 2137. Each 4.00

For prevailing prices see latest supplementary price list.

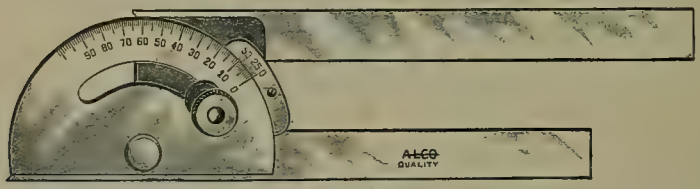
DRAFTSMEN'S PROTRACTORS



No. 2150

No. 2150 Draftsmen's Steel Protractor with 8½ in. blade, graduated to single degrees, vernier reading to 5 minutes. Each $6.50
No. 2151 Morocco Case for Protractor No. 2150. Each 1.25

Draftsmen's Protractor No. 2150 is made of sheet steel and is light and durable. This Protractor can be quickly set to any angle. It can be used either side up and on either of the two outside edges of the frame. Advantageously used in dividing circles, transferring angles, or laying off given angles, without resetting, on either side of a line. It forms a convenient extension of a T-square and frequently takes the place of 45-degree and 60-degree angles.



Nos. 2155-56

No. 2155 Draftsmen's German silver Protractor with 9 in. blade, arc 4 in. in diameter, graduated to single degrees, vernier reading to 5 minutes. Each $10.00
No. 2156, same as No. 2155, but of steel instead of German silver. Each 4.00
No. 2157 Mahogany Case for Protractors Nos. 2155-56. Each 1.00

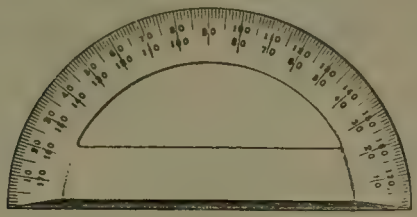
Draftsmen's Protractors Nos. 2155 and 2156 have a clamping screw which securely holds the blade at any angle, and also serves as a knob.

Either blade can be used in contact with a T-square, giving any angle and its complement from 0° to 90°.

Protractor No. 2155 is engine divided, and very finely finished for draftsmen's use and is a more precise instrument than No. 2156.

For prevailing prices see latest supplementary price list.

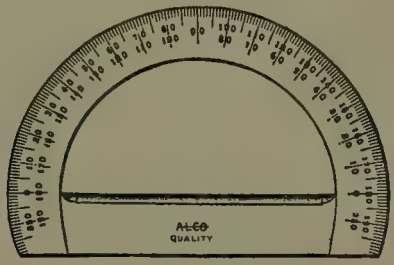
ALCO SUPERIOR PROTRACTORS



Nos. 2160-65

Center on outer edge.

No. 2160	Semicircular German silver Protractor, 4 in., beveled edge, divided to 1 degree. Each	$1.45
No. 2161	Do., 5 in., divided to ½ degree. Each	1.80
No. 2162	Do., 6 in., divided to ½ degree. Each	2.40
No. 2163	Do., 6 in., divided to ¼ degree. Each	2.90
No. 2164	Do., 7 in., divided to ¼ degree. Each	3.50
No. 2165	Do., 8 in., divided to ¼ degree. Each	4 20



Nos. 2170-75

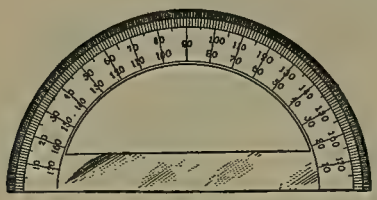
Center on inner edge.

No. 2170	Semicircular German silver Protractor, 4 in., beveled edge, divided to 1 degree. Each	$1.80
No. 2171	Do., 5 in., divided to ½ degree. Each	2.25
No. 2172	Do., 6 in., divided to ½ degree. Each	2.90
No. 2173	Do., 6 in., divided to ¼ degree. Each	3.50
No. 2174	Do., 7 in., divided to ¼ degree. Each	5.00
No. 2175	Do., 8 in., divided to ¼ degree. Each	6.75

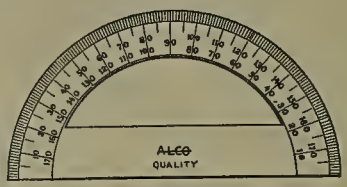
Circular German silver Protractor, 5 in., see No. 2125, on page 390.

For prevailing prices see latest supplementary price list.

METAL PROTRACTORS



Nos. 2180-84



Nos. 2190-93

German Silver.

No. 2180 Semicircular German silver Protractor, 4 in., divided to 1°. Each..... $0.40
No. 2181 Semicircular German silver Protractor, 5 in., divided to ½°. Each..... .60
No. 2182 Semicircular German silver Protractor, 6 in., divided to ½°. Each..... .80
No. 2183 Semicircular German silver Protractor, 7 in., divided to ½°. Each..... 1.15
No. 2184 Semicircular German silver Protractor, 8 in., divided to ½°. Each..... 1.50

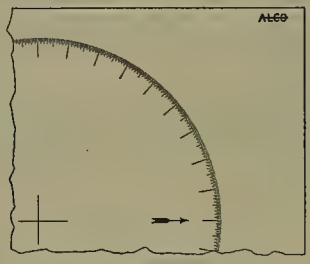
Brass.

No. 2190 Semicircular brass Protractor, 3¾ in., divided to 1°. Each..... $0.09
No. 2191 Semicircular brass Protractor, 4¼ in., divided to 1°. Each..... .25
No. 2192 Semicircular brass Protractor, 5⅛ in., divided to ½°. Each..... .50
No. 2193 Semicircular brass Protractor, 6⅜ in., divided to ½°. Each..... .75

Nickel-Plated.

No. 2194 Swiss nickel-plated School Protractor, 3⅜ in., divided to 1°. Each..... .25

PAPER PROTRACTORS



Nos. 2200-2205

No. 2200 Circular Protractor on Drawing Paper, 8 in. diam. in ½°..... $0.20
No. 2201 Circular Protractor on Drawing Paper, 14 in. diam. in ¼°..... .30
No. 2202 Circular Protractor on Bristol Board, 8 in. diam. in ½°..... .20
No. 2203 Circular Protractor on Bristol Board, 14 in. diam. in ¼°..... .40
No. 2204 Circular Protractor on Tracing Paper, 8 in. diam. in ½°..... .20
No. 2205 Circular Protractor on Tracing Paper, 14 in. diam. in ¼°..... .30

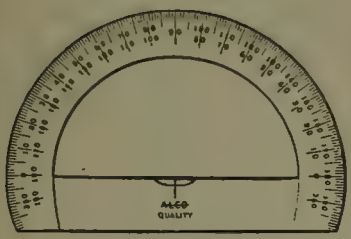
PAPER PROTRACTORS MOUNTED ON LINEN

No. 2202M Circular Protractor, Bristol Board mounted on linen, 8 in. diam. in ½°.. $0.30
No. 2203M Circular Protractor, Bristol Board mounted on linen, 14 in. diam. in ¼°.. .55

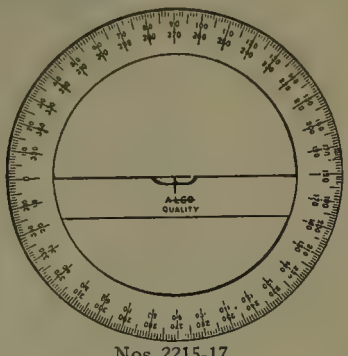
For prevailing prices see latest supplementary price list.

ALCO TRANSPARENT PROTRACTORS

Heavy, with Beveled Edges



Nos. 2210-11



Nos. 2215-17

No. 2210 Semicircular Amber Protractor, 6 in., divided to ½°. Each.. $2.75
No. 2211 Semicircular Amber Protractor, 8 in., divided to ½°. Each.. 3.50
No. 2215 Circular Amber Protractor, 6 in., divided to ½°. Each..... 3.50
No. 2216 Circular Amber Protractor, 8 in., divided to ½°. Each..... 4.50
No. 2217 Circular Amber Protractor, 10 in., divided to ½°. Each..... 5.50

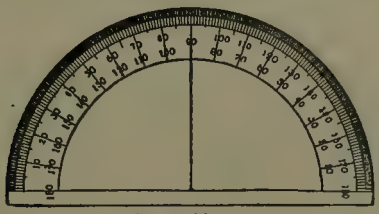
TRANSPARENT AMBER PROTRACTORS

Best Quality

Engine Divided, Open Center, Square Edges.

No. 2220 Semicircular Amber Protractor, 4 in., divided to ½°. Each. $1.00
No. 2221 Semicircular Amber Protractor, 5 in., divided to ½°. Each. 1.20
No. 2222 Semicircular Amber Protractor, 6 in., divided to ½°. Each. 1.40
No. 2223 Semicircular Amber Protractor, 7 in., divided to ½°. Each. 1.75
No. 2224 Semicircular Amber Protractor, 8 in., divided to ½°. Each. 2.00
No. 2225 Semicircular Amber Protractor, 10 in., divided to ½°. Each. 3.00

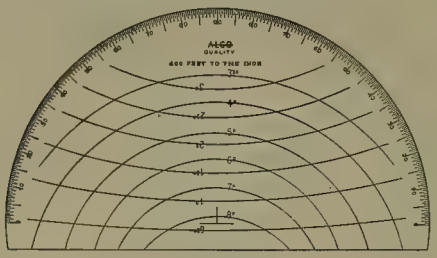
TRANSPARENT CELLULOID PROTRACTORS



Nos. 2230-34

No. 2230 Semicircular Celluloid Protractor, 4 in., divided to ½°..... $0.35
No. 2231 Semicircular Celluloid Protractor, 5 in., divided to ½°..... .45
No. 2232 Semicircular Celluloid Protractor, 6 in., divided to ½°..... .60
No. 2233 Semicircular Celluloid Protractor, 7 in., divided to ½°..... .75
No. 2234 Semicircular Celluloid Protractor, 8 in., divided to ½°..... 1.20
No. 2235 Semicircular Celluloid Protractor, 10 in., divided to ½°..... 2.00

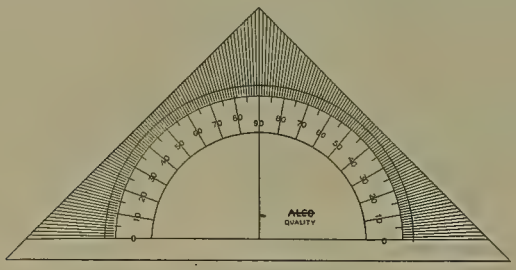
TRANSPARENT RAILROAD CURVE PROTRACTORS



No. 2240

No. 2240 Amber Railroad Curve Protractor, 8 in., divided to ½° with circular curves from ½° to 8°, scale 400 feet to the inch. Each $2.75
No. 2241, same as No. 2240 but 10 in., and circular curves from 1° to 20°, scale 100 feet to the inch. Each..... 3.25

TRANSPARENT TRIANGLE PROTRACTORS



No. 2250-52

No. 2245 Amber Triangle Protractor, 30x60°, 5 in., divided to 1°. Ea. $0.45
No. 2246 Amber Triangle Protractor, 30x60°, 6 in., divided to 1°. Ea. .50
No. 2247 Amber Triangle Protractor, 30x60°, 7 in., divided to 1°. Ea. .70
No. 2250 Amber Triangle Protractor, 45°, 5 in., divided to 1°. Ea. .50
No. 2251 Amber Triangle Protractor, 45°, 6 in., divided to 1°. Ea. .70
No. 2252 Amber Triangle Protractor, 45°, 7 in., divided to 1°. Ea. .90

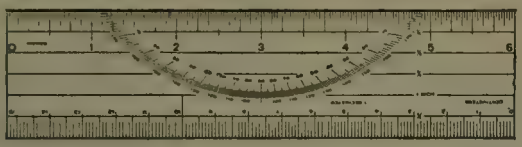
TRANSPARENT PLOTTING PROTRACTORS

No. 2255 Transparent Plotting Protractor, with arms, 8 in. long. Ea. $1.25
No. 2256 Engineers' Field Book Assistant and Protractor. Ea..... .50

For complete description and illustrations of Protractors Nos. 2255 and 2256 see page 218.

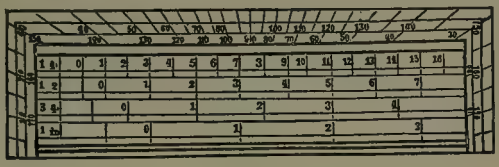
For prevailing prices see latest supplementary price list.

TRANSPARENT SCALE PROTRACTORS



Nos. 2260-65 Transparent Scale Protractors. For complete description and price list see page 218.

IVORY AND BOXWOOD PROTRACTORS



Nos. 2270-72

No. 2270 Boxwood Protractor, 6 in. long, 1¾ in. wide, scales of ¼, ½, ¾ and 1 inch to the foot, scale of chords, diagonal scales.. $0.35

No. 2271 Ivory Protractor, 6 in. long, 1¾ in. wide, divided: whole degrees, ¼, ½, ¾ and 1 inch scales, scale of chords, diagonal scale, scales of 25, 30, 35, 40 and 45 parts to the inch..... 1.75

No. 2272 Ivory Protractor, 6 in. long, 1¾ in. wide, divided: whole degrees, ⅛, ¼, ⅜, ½, ⅝, ¾, ⅞, 1 inch scales, scale of chords, diagonal scales, scales of 30, 35, 40, 45, 50, 60 parts to the inch, 40 scale on lower edge..... 2.50

MILITARY PROTRACTOR AND SCALES

No. 2275 Square Transparent Amber Military Protractor, 6 in. long, 1¾ in. wide, with beveled edges, divided: whole degrees, scales 1, 2, 3 and 4 inches to the mile, reading to yards. Scale of chords and scale of inches divided to 10ths on lower edge $3.00

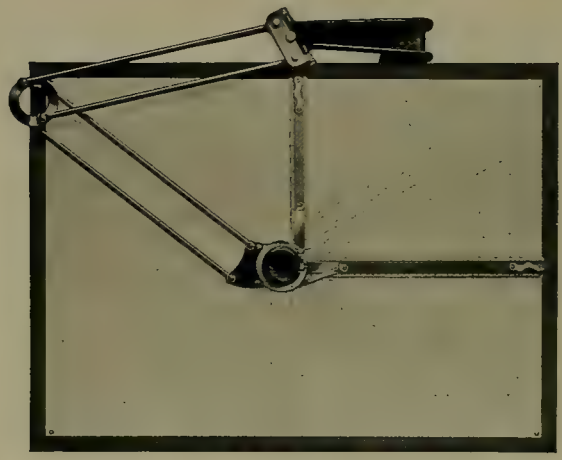
No. 2276 Battery Commanders' Scales, cardboard, about 6 in. long, 1¼ in. wide, divided in mills, for measuring range and angle of departure ..... .10

No. 2277 Battery Commanders' Scale, same as No. 2276 but boxwood .25

No. 2279 Triangular Pace and Contour Scale and Alidade, 8 in. long, hardwood, loaded through center with lead, U. S. Army School design ..... .50

For prevailing prices see latest supplementary price list.

THE UNIVERSAL DRAFTING MACHINE



Cut shows Mid-Anchor Machine

The Universal Drafting Machine consists of two parallelograms, a protractor, and a square having graduated ruling edges. The blades of the square are interchangeable for all graduations.

The two parallelograms joined together constitute an arm which, anchored to the board, gives the protractor and square a parallel motion about the drawing. This form of parallel motion permits either zero on the ruling edges to be instantly placed at any point on the drawing, by a single direct movement, and a line being drawn along the graduated ruling edge, just the exact length required.

A conveniently arranged protractor permits the square to be set at any angle, and it then has the same parallel motion about the board as when set at zero, Machines are furnished with either of the three following protractors:

STANDARD PROTRACTOR. Has graduated arc allowing square to be set at any angle, and is provided with automatic stops allowing the square to be instantly set at 30°, 45°, 60° and 90°, without stopping to read or clamp the protractor.

ARCHITECTURAL AND STRUCTURAL PROTRACTOR. Special graduations are added to this protractor giving one-fifth, one-fourth and one-third roof pitches each way from zero, also special graduations to give two inches to the foot each way from zero.

CIVIL ENGINEERS' PROTRACTOR. This protractor has two independent swinging motions, the same as on a transit. The protractor is graduated to one-half degrees and the vernier reads to minutes. With the aid of this protractor it is a simple matter to duplicate work (done in the field) on the drawing, directly from the field notes.

HARDENED JOINT AND SOLID ROD DRAFTING MACHINES

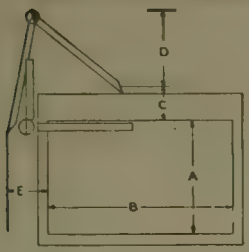
The Hardened Joint Solid Rod Drafting Machine is a development from the original construction of the Drafting Machine. Hardened, ground and polished straight cylindrical pins working in hardened, ground and polished bearings form the bearings of this machine, and if kept properly lubricated and free from dirt they will give many years of good service with no perceptible wear.

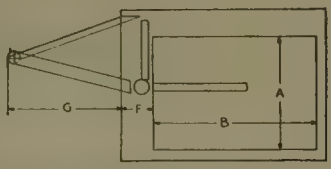
BALL BEARING TUBULAR ROD DRAFTING MACHINES

The Ball Bearing Tubular Rod Drafting Machine is an achievement that makes the Drafting Machine practically ideal. It has absolutely no play in the bearings and is frictionless. It is light in weight and possesses great rigidity, and is exceedingly accurate, and the motion is smooth and light.

Complete booklet fully describing Universal Drafting Machines and accessories mailed on application.

THE UNIVERSAL DRAFTING MACHINE





CAPACITIES AND CLEARANCES

Mid-Anchor Form.

Size Length of Rods	Rated Capacity A	Rated Capacity B	Maximum Capacity A	Maximum Capacity B	Max. Clearance for extreme corner position only C	D	E
[illegible]	20	30	24	36	6″	12″	7″
21	[illegible]	36	27	45	7″	14″	7″
24	30	42	30	52	8″	16″	7″
[illegible]	36	50	36	60	9″	19″	7″
32	40	60	40	70	10″	22″	7″
36	47	60	48	78	12″	24″	7″

Corner Anchor Form

Size Length of Rods	Rated Capacity A	Rated Capacity B	Maximum Capacity A	Maximum Capacity B	Max. Clearance for extreme corner position only F	G
18	18	24	20	30	7″	18″
21	20	30	24	32	7″	21″
24	24	36	27	38	7″	24″
[illegible]	30	42	32	45	7″	28″
32	32	48	36	51	7″	32″
36	36	54	40	60	7″	36″

PRICE LIST

Prices in vogue March 1, 1918.

HARDENED JOINT AND SOLID ROD DRAFTING MACHINES

Prices of Machine only, without scales.

	Standard Protractor	Architect's Protractor	Civil Engineer's Protractor
Mid-Anchor, sizes 18, 21, 24 or 28	$42.50	$45.00	$71.00
Corner Anchor, sizes 18, 21, 24 or 28	37.50	40.00	66.00
Mid-Anchor, sizes 32 and 36	47.50	50.00	76.00
Corner Anchor, sizes 32 and 36	42.50	45.00	71.00

BALL BEARING TUBULAR ROD DRAFTING MACHINES

Prices of Machine only, without scales.

	Standard Protractor	Architect's Protractor	Civil Engineer's Protractor
Mid-Anchor, sizes 18, 21, 24 or 28	$55.00	$57.50	$83.50
Corner Anchor, sizes 18, 21, 24 or 28	52.50	55.00	81.00
Mid-Anchor, sizes 32 and 36	60.00	62.50	88.50
Corner Anchor, sizes 32 and 36	57.50	60.00	86.00

Standard or Architect's Protractor, with vernier to 5 minutes, extra $3.50

THE JUNIOR DRAFTING MACHINE

Working Capacity 18x24″	Price without scales.
Mid-Anchor, Standard Protractor	$22.00
Corner Anchor, Standard Protractor	20.00

FLAT WHITE-EDGE SCALES WITH CHUCKING PLATES FOR U. D. MACHINES

24 in	$3.50	12 in	$1.75
18 in	2.75	6 in	1.25

When ordering, state length of scales wanted and order graduation by the following numbers: No. 1, 3x1½″-¾x⅜″; No. 2, 1x½″-¼x⅛″; No. 3, full and half; No. 4, 10x50, No. 5, 20x40; No. 6, 30x60″; No. 7, 3x1½″; No. 8, ¾x⅜″; No. 9, 1x½″; No. 10, ¼x⅛″; No. 11, MMx½MM; No. 12, 1:1x1:2, No. 13, 1:5x1:10; No. 14, 1:15x1:25.

STRAIGHTEDGES WITH CHUCKING PLATES FOR U. D. MACHINES

	Ebony Lined	Amber Lined
12 in	$0.75	$1.50
18 in	1.00	1.75
24 in	1.25	2.00

Universal Drafting Machine Thumbtacks, see page 524

For prevailing prices see latest supplementary price list.

DRAFTSMEN'S SCALES

~~ALCO~~ Quality

We offer two types of scales: the Plain Boxwood and the White Edge, the latter a combination of boxwood and celluloid. Both are made of the finest materials and the wood is thoroughly seasoned. They are engine divided to United States standard measurements and the graduations are fine and clear and deeply cut. Both the Boxwood and the White Edge Scales are made in a variety of shapes, described as follows:

Triangular Scales, Regular Shape. This type of scale has the advantage of possessing six surfaces and affords the greatest range of scales.

Triangular Scales, Improved Shape. Like the regular shape, possess six surfaces but the concaved facet shape affords a better contact with the drawing and allows a better angle of vision. It prevents the divisions from wearing off by friction.

Flat Scales, Regular Shape. The regular shape flat scales have two bevels for graduations. The graduations are more conveniently read than on the triangular scales.

Flat Scales, Double Bevel. These scales have four bevels for graduations, but this shape necessitates the raising of the scale to bring the edge in close contact with the paper.

Flat Scales, Opposite Bevel. This type of scale is an improvement on the regular flat scale as it presents but one graduated bevel to the eye. It is easily picked up or turned.

DRAFTSMEN'S SCALES

~~ALCO~~ Quality

SCALES MADE TO ORDER

We are equipped to furnish special scales of all kinds, and in order to avoid mistakes or delay in prolonged corresponding we offer the following suggestions when ordering special scales:

1—State whether Boxwood or White Edge Scale is wanted.

2—State shape scale is to be. (See page 400.)

3—State length of scale wanted.

4—How each edge is to be graduated. State whether to be Open Divided or Full Divided.

There are two distinctly different ways of graduating a scale: the Open Divided and the Full Divided Scale.

The Open Divided Scales are generally used for architectural or mechanical drawing and are divided in inches or parts of inches, which represent feet or full inches. The units are graduated along the entire length and the end units only are subdivided to inches or fractions.

When ordering a scale divided with different divisions, two to each edge, one of these must be the double of the other, as for instance, ½x1, 1½x3 or ⅛x¼. One of the divisions on each edge is then numbered from the right and one from the left. On an open divided scale with but one division to each edge each scale is ordinarily numbered reading from right to left and from left to right, and each end unit is subdivided to inches or fractions.

We can furnish the above scales, fully divided, to order if desired.

The Full Divided Scales, or Chain Scales, as they are commonly called, are used mostly by surveyors or civil engineers. They are generally divided to decimals of inches or feet, and subdivided the entire length of the scale. Therefore it is possible to have only one division to each edge. They are usually numbered continuous every ten divisions, the triangular scales reading from left to right and the flat scales reading both ways, i. e., from left to right and from right to left.

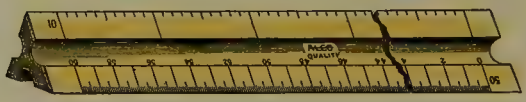
5—State how each edge is to be numbered, from left to right or right to left or both ways.

It is advisable when ordering special scales to furnish us a sketch. This need not be accurate. All that is necessary is to show the divisions as you want them, the length of the various graduation marks, and the numbering as it is wanted.

TRIANGULAR BOXWOOD SCALES

Machine Divided

Regular Shape



Graduated 10, 20, 30, 40, 50 and 60 parts to the inch.

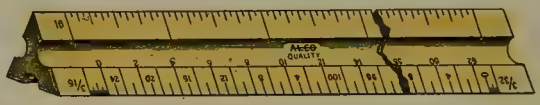
No. 2300— 3 in.	$0.30
No. 2301— 6 in.	.50
No. 2302—12 in.	.75
No. 2303—18 in.	2.40
No. 2304—24 in.	4.20

Graduated 20, 30, 40, 50, 60, 80 parts to the inch.

No. 2306— 6 in.	$0.60
No. 2307—12 in.	.90
No. 2308—18 in.	2.90
No. 2309—24 in.	5.00

Graduated 100, 200, 300, 400, 500, 600 parts to the inch.

No. 2312—12 in.	$1.25



Graduated 3-32, 3-16, ⅛, ¼, ⅜, ½, ¾, 1, 1½ and 3 inches to the foot. One edge 16 to the inch.

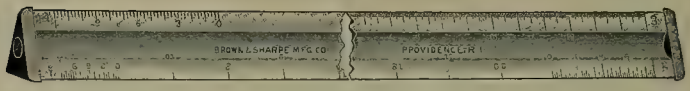
No. 2320— 3 in.	$0.30
No. 2321— 6 in.	.50
No. 2322—12 in.	.75
No. 2323—18 in.	2.40
No. 2324—24 in.	4.20

Graduated ⅛, ¼, ½, 1, ⅜, ¾, 1½, 2, 3 and 4 inches to foot.

No. 2326— 6 in.	$0.50
No. 2327—12 in.	.75
No. 2328—18 in.	2.40
No. 2329—24 in.	4.20

TRIANGULAR METAL SCALES

Steel, Nickel Plated.



No. 2330—12 in. Engineers', divided like No. 2302	$2.50
No. 2331—12 in. Engineers', divided like No. 2307	2.50
No. 2332—12 in. Architects', divided like No. 2322	2.50

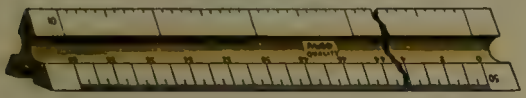
For Metric Scales see page 405.

For prevailing prices see latest supplementary price list.

TRIANGULAR WHITE-EDGE SCALES

Machine Divided

Regular Shape



Graduated 10, 20, 30, 40, 50, 60 parts to the inch.

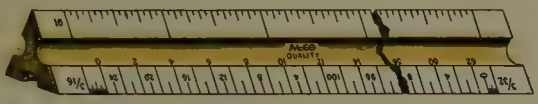
No. 2340— 3 in.	$0.75
No. 2341— 6 in.	1.25
No. 2342—12 in.	2.00
No. 2343—18 in.	4.00
No. 2344—24 in.	6.00

Graduated 20, 30, 40, 50, 60, 80 parts to the inch.

No. 2346— 6 in.	$1.40
No. 2347—12 in.	2.25
No. 2348—18 in.	4.50
No. 2349—24 in.	6.75

Graduated 100, 200, 300, 400, 500, 600 parts to the inch.

No. 2352—12 in.	$2.25



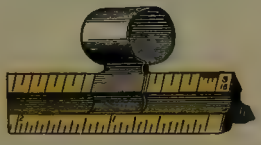
Graduated 3-32, 3-16, ⅛, ¼, ⅜, ¾, ½, 1, 1½ and 3 inches to foot.

No. 2360— 3 in.	$0.75
No. 2361— 6 in.	1.25
No. 2362—12 in.	2.00
No. 2363—18 in.	4.00
No. 2364—24 in.	6.00

Graduated ⅛, ¼, ½, 1, ⅜, ¾, 1½, 2, 3 and 4 inches to foot.

No. 2366— 6 in.	$1.25
No. 2367—12 in.	2.00
No. 2368—18 in.	4.00
No. 2369—24 in.	6.00

SCALE GUARDS



No. 2370

No. 2370 Metal Guards for Triangular Scales	$0.20

SHEATHS FOR TRIANGULAR SCALES

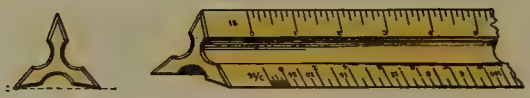
Made of heavy cardboard, velvet lined.

Length of Scale, inches—	6	12	18	24
No. 2371 For Regular Shape Scales	$0.20	$0.25	$0.40	$0.50
No. 2372 For Improved Shape Scales	.20	.25	.40	.50

TRIANGULAR SCALES—IMPROVED SHAPE

Machine Divided

BOXWOOD



Graduated 10, 20, 30, 40, 50 and 60 parts to the inch.

No. 2301X— 6 in.	$0.75
No. 2302X—12 in.	1.00

Graduated 20, 30, 40, 50, 60, 80 parts to the inch.

No. 2306X— 6 in.	$0.90
No. 2307X—12 in.	1.25

Graduated 100, 200, 300, 400, 500, 600 parts to the inch.

No. 2312X—12 in.	$1.50

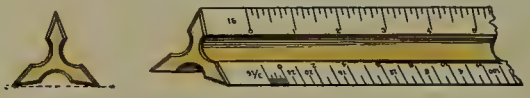
Graduated 3-32, 3-16, ⅛, ¼, ⅜, ½, ¾, 1, 1½ and 3 inches to the foot. One edge 16 to the inch.

No. 2321X— 6 in.	$0.75
No. 2322X—12 in.	1.00

Graduated ⅛, ¼, ½, 1, ⅜, ¾, 1½, 2, 3 and 4 inches to the foot.

No. 2326X— 6 in.	$0.75
No. 2327X—12 in.	1.00

WHITE-EDGE



Graduated 10, 20, 30, 40, 50, 60 parts to the inch.

No. 2341X— 6 in.	$1.50
No. 2342X—12 in.	2.25
No. 2343X—18 in.	4.50
No. 2344X—24 in.	6.50

Graduated 20, 30, 40, 50, 60, 80 parts to the inch.

No. 2346X— 6 in.	$1.75
No. 2347X—12 in.	2.50

Graduated 100, 200, 300, 400, 500, 600 parts to the inch.

No. 2352X—12 in.	....

Graduated 3-32, 3-16, ⅛, ¼, ⅜, ¾, ½, 1, 1½ and 3 inches to foot.

No. 2361X— 6 in.	$1.50
No. 2362X—12 in.	2.25
No. 2363X—18 in.	4.50
No. 2364X—24 in.	6.50

Graduated ⅛, ¼, ½, 1, ⅜, ¾, 1½, 2, 3 and 4 inches to foot.

No. 2366X— 6 in.	$1.50
No. 2367X—12 in.	2.25
No. 2368X—18 in.	4.50
No. 2369X—24 in.	6.50

METRIC SCALES

TRIANGULAR BOXWOOD, REGULAR SHAPE

No. 2380—20 cm. long, div. .01, .02, .03, .05, .025, .0125	$0.90
No. 2381—30 cm. long, div. .01, .02, .03, .05, .025, .0125	1.00
No. 2382—50 cm. long, div. .01, .02, .03, .05, .025, .0125	2.25

Improved Shape made to order only.

TRIANGULAR WHITE-EDGE, REGULAR SHAPE

No. 2385—20 cm. long, div. .01, .02, .03, .05, .025, .0125	$2.25
No. 2386—30 cm. long, div. .01, .02, .03, .05, .025, .0125	2.50
No. 2387—50 cm. long, div. .01, .02, .03, .05, .025, .0125	5.50

Improved Shape made to order only.

FLAT BOXWOOD METRIC SCALES

No. 2390—10 cm. long, div. mm. and half mm	$0.50
No. 2391—20 cm. long, div. mm. and half mm	.60
No. 2392—30 cm. long, div. mm. and half mm	.75
No. 2393—50 cm. long, div. mm. and half mm	1.50

FLAT WHITE-EDGE METRIC SCALES

No. 2395—10 cm. long, div. mm. and half mm	$0.75
No. 2396—20 cm. long, div. mm. and half mm	1.00
No. 2397—30 cm. long, div. mm. and half mm	1.25
No. 2398—50 cm. long, div. mm. and half mm	2.25

METRIC SCALES IN SETS

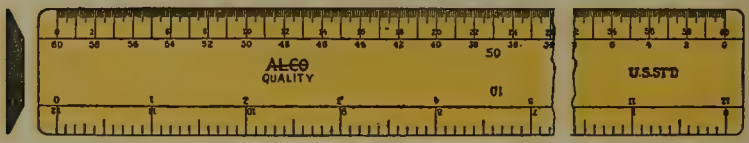
In neat polished mahogany case.

No. 2400 Set of 6 Boxwood Scales 30 cm. long, divided metric .01, .02, .03, .05, .025, .0125. Set	$6.00
No. 2401 Set of 6 Boxwood Scales 50 cm. long, divided metric .01, .02, .03, .05, .025, .0125. Set	11.00
No. 2402 Set of 6 White-Edge Scales 30 cm. long, divided metric .01, .02, .03, .05, .025, .0125. Set	9.00
No. 2403 Set of 6 White-Edge Scales 50 cm. long, divided metric .01 .02, .03, .05, .025, .0125. Set	17.00

For prevailing prices see latest supplementary price list.

FLAT BOXWOOD SCALES

REGULAR SHAPE



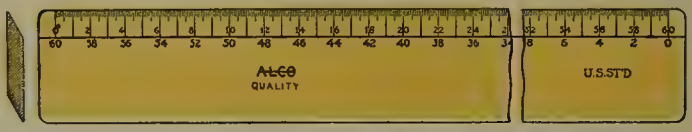
Divided inches and 10ths.

No. 2410— 6 in.	10x50	parts to inch	$0.50
No. 2411— 6 in.	10x20	parts to inch	.50
No. 2412— 6 in.	20x40	parts to inch	.50
No. 2413— 6 in.	30x60	parts to inch	.50
No. 2414— 6 in.	80x100	parts to inch	.75
No. 2415—12 in.	10x50	parts to inch	.75
No. 2416—12 in.	10x20	parts to inch	.75
No. 2417—12 in.	20x40	parts to inch	.75
No. 2418—12 in.	30x60	parts to inch	.75
No. 2419—12 in.	80x100	parts to inch	1.00

Divided feet in 100ths.

No. 2420—12 in.	100x500	parts to foot	$0.75
No. 2421—12 in.	200x400	parts to foot	.75
No. 2422—12 in.	300x600	parts to foot	.75
No. 2423—12 in.	800x1000	parts to foot	1.00

OPPOSITE BEVEL SHAPE



Divided inches and 10ths.

No. 2430—12 in.	10x50	parts to inch	$0.75
No. 2431—12 in.	20x40	parts to inch	.75
No. 2432—12 in.	30x60	parts to inch	.75
No. 2433—12 in.	80x100	parts to inch	1.00

Divided feet in 100ths.

No. 2435—12 in.	100x500	parts to foot	$0.75
No. 2436—12 in.	200x400	parts to foot	.75
No. 2437—12 in.	300x600	parts to foot	.75
No. 2438—12 in.	800x1000	parts to foot	1.00

For Flat Boxwood Scales in sets see page 412.

For prevailing prices see latest supplementary price list.

FLAT BOXWOOD SCALES

Machine Divided

REGULAR SHAPE

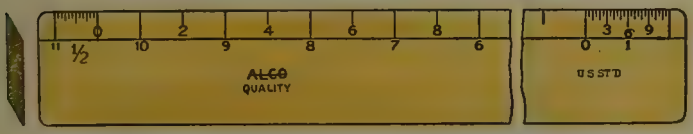
Graduated ⅛, ¼, ½ and 1 inch to the foot.
No. 2442 reads 100 feet on ⅛; 50 feet on ¼ and 25 feet on ½ inch.

No. 2440— 6 in.	$0.50
No. 2441—12 in.	.75
No. 2442—12½ in.	.85
No. 2443—18 in.	1.50
No. 2444—24 in.	2.00

Graduated ⅜, ¾ 1½ and 3 inches to foot.

No. 2446— 6 in.	$0.50
No. 2447—12 in.	.75
No. 2448—18 in.	1.50
No. 2449—24 in.	2.00

OPPOSITE BEVEL SHAPE



Graduated ⅛, ¼, ½ and 1 inch to the foot.

No. 2450— 6 in.	$0.50
No. 2451—12 in.	.75
No. 2452—12½ in.	.85

Graduated ⅜, ¾ 1½ and 3 inches to foot.

No. 2454— 6 in.	$0.50
No. 2455—12 in.	.75

DOUBLE BEVEL SHAPE

Graduated ⅛, ¼, ½, 1 x ⅜, ¾, 1½ and 3 inches to the foot.

No. 2460— 6 in.	$0.85
No. 2461—12 in.	1.20
No. 2462—18 in.	2.25
No. 2463—24 in.	3.00

For Flat Boxwood Scales in sets see page 412.

FLAT BOXWOOD SCALES

Machine Divided

Regular Shape

MISCELLANEOUS DIVISIONS

No. 2470—12 in. .....10x12 parts to inch.....	$0.75
No. 2471—12 in. .....10x16 parts to inch.....	.75
No. 2472—12 in. .....12x16 parts to inch.....	.75
No. 2473—12 in. .....16x32 parts to inch.....	.75
No. 2474—12 in. .....32x64 parts to inch.....	.75
No. 2475— 6 in. divided 16ths in. and millimeters.....	.50
No. 2476—12 in. divided 16ths in. and millimeters.....	.75

SCALE OF PROPORTIONAL INCHES

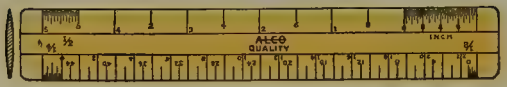
Flat Boxwood, Opposite Bevel Shape

No. 2479—12 in. $0.75

Scale No. 2479 is graduated ⅛, ¼, ½ and full size in inches, two scales on each edge, and the unit beyond the zero point is subdivided.

FLAT BOXWOOD POCKET SCALES

Double Bevel Shape



In Leather Sheath, ¾ in. wide.

No. 2480—6 in., divided 10, 40, 30 and 50 parts to inch.....	$0.75
No. 2481—6 in., divided ⅛, ¼, ½, 1, ⅜, ¾, 1½ and 3 inches to the foot	.75

FLAT METAL SCALES

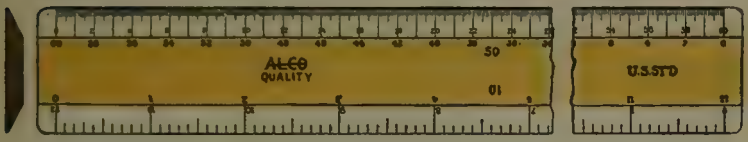
Steel, Nickel Plated

Opposite Bevel Shape

No. 2485—12 in., graduated on 4 edges, 10, 40, 50 and 100 parts to inch	$2.00
No. 2486—12 in., graduated on 4 edges, 8, 16, 32 and 64 parts to inch	2.00

FLAT WHITE-EDGE SCALES

REGULAR SHAPE



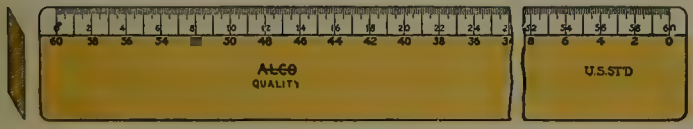
Divided inches and 10ths.

No. 2510— 6 in.	10x50	parts to inch	$0.75
No. 2511— 6 in.	10x20	parts to inch	.75
No. 2512— 6 in.	20x40	parts to inch	.75
No. 2513— 6 in.	30x60	parts to inch	.75
No. 2514— 6 in.	80x100	parts to inch	1.00
No. 2515—12 in.	10x50	parts to inch	1.25
No. 2516—12 in.	10x20	parts to inch	1.25
No. 2517—12 in.	20x40	parts to inch	1.25
No. 2518—12 in.	30x60	parts to inch	1.25
No. 2519—12 in.	80x100	parts to inch	1.50

Divided feet in 100ths.

No. 2520—12 in.	100x500	parts to foot	$1.25
No. 2521—12 in.	200x400	parts to foot	1.25
No. 2522—12 in.	300x600	parts to foot	1.25
No. 2523—12 in.	800x1000	parts to foot	1.50

OPPOSITE BEVEL SHAPE



Divided inches and 10ths.

No. 2530—12 in.	10x50	parts to inch	$1.25
No. 2531—12 in.	20x40	parts to inch	1.25
No. 2532—12 in.	30x60	parts to inch	1.25
No. 2533—12 in.	80x100	parts to inch	1.50

Divided feet in 100ths.

No. 2535—12 in.	100x500	parts to foot	$1.25
No. 2536—12 in.	200x400	parts to foot	1.25
No. 2537—12 in.	800x1000	parts to foot	1.50

For Flat White-edge Scales in sets see page 413.

For prevailing prices see latest supplementary price list.

FLAT WHITE-EDGE SCALES

Machine Divided

REGULAR SHAPE

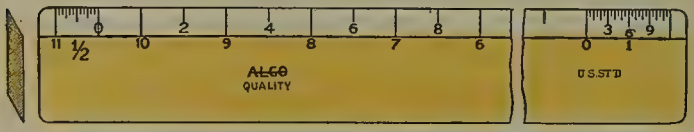
Graduated ⅛, ¼, ½, and 1 inch to the foot.
No. 2542 reads 100 feet on ⅛, 50 feet on ¼ and 25 feet on ½ inch.

No. 2540— 6 in.	$0.75
No. 2541—12 in.	1.25
No. 2542—12½ in.	1.35
No. 2543—18 in.	2.25
No. 2544—24 in.	3.00

Graduated ⅜, ¾, 1½ and 3 inches to foot.

No. 2546— 6 in.	$0.75
No. 2547—12 in.	1.25
No. 2548—18 in.	2.25
No. 2549—24 in.	3.00

OPPOSITE BEVEL SHAPE



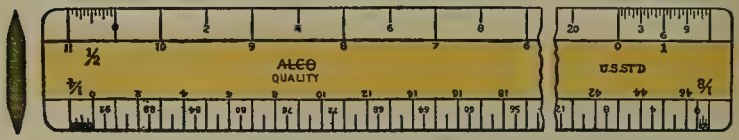
Graduated ⅛, ¼, ½, and 1 inch to the foot.

No. 2550— 6 in.	$0.75
No. 2551—12 in.	1.25
No. 2552—12½ in.	1.35

Graduated ⅜, ¾, 1½ and 3 inches to foot.

No. 2554— 6 in.	$0.75
No. 2555—12 in.	1.25

DOUBLE BEVEL SHAPE



Graduated ⅛, ¼, ½ x 1, ⅜, ¾, 1½ and 3 inches to the foot.

No. 2560— 6 in.	$1.35
No. 2561—12 in.	2.00
No. 2562—18 in.	3.50
No. 2563—24 in.	4.75

For Flat White-edge Scales in sets see page 413.

FLAT WHITE-EDGE SCALES

Machine Divided
Regular Shape

MISCELLANEOUS DIVISIONS

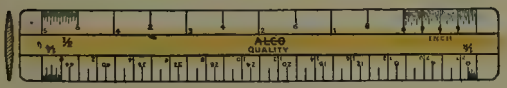
No. 2570—12 in.	10x12 parts to inch.....	$1.25
No. 2571—12 in.	10x16 parts to inch.....	1.25
No. 2572—12 in.	12x16 parts to inch.....	1.25
No. 2573—12 in.	16x32 parts to inch.....	1.25
No. 2574—12 in.	32x64 parts to inch.....	1.25
No. 2575—12 in.	330x660 parts to inch.....	1.50
No. 2576— 6 in., divided 16ths in. and millimeters.....		.75
No. 2577—12 in., divided 16ths in. and millimeters.....		1.25

SCALE OF PROPORTIONAL INCHES
Flat White-edge, Opposite Bevel Shape

No. 2579—12 in. $1.25

Scale No. 2579 is graduated ⅛, ¼, ½ and full size in inches, two scales on each edge, and the unit beyond the zero point is subdivided.

FLAT WHITE-EDGE POCKET SCALES
Double Bevel Shape



In Leather Sheath, ¾ in. wide.

No. 2580—6 in., divided 10, 40, 30 and 50 parts to inch.....	$1.35
No. 2581—6 in., divided ⅛, ¼, ½, 1x⅜, ¾, 1½, 3 inches to the foot..	1.35

DIAMETER AND CIRCUMFERENCE SCALE
Regular Shape

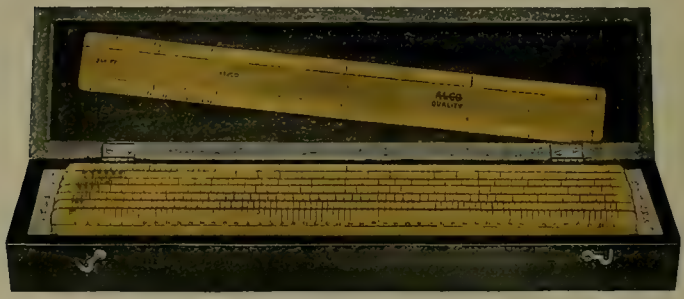
No. 2584—12 in., divided for diameter and circumference..... $1.75

The divisions on this scale are in the ratio of diameter to circumference of a circle; one edge is divided in inches to 32nds, the other to spaces 3.1416 in. to 128ths.

For prevailing prices see latest supplementary price list.

FLAT BOXWOOD SCALES IN SETS

In partitioned mahogany boxes, highly polished and well made.



OPEN DIVIDED SCALES

These Scales have the same divisions on both edges, one edge reading from left to right, the other edge from right to left.

No. 2604 Set of 4 Boxwood Scales, 12 in., divided ⅛, ¼, ½, 1 in. to the foot. Per set..... $4.25

No. 2608 Set of 8 Boxwood Scales, 12 in. divided ⅛, ¼, ½, 1, ⅜, ¾, 1½, 3 in. to the foot. Per set..... 7.50

No. 2612 Set of 12 Boxwood Scales, 12 in., divided ⅛, ¼, ½, 1, ⅜, ¾, 1½, 2, 3, 4, 6, 12 in. to the foot. Per set..... 11.00

No. 2614 Set of 4 Boxwood Scales, 18 in., divided ⅛, ¼, ½, 1 in. to the foot. Per set..... 7.75

No. 2618 Set of 8 Boxwood Scales, 18 in., divided ⅛, ¼, ½, 1, ⅜, ¾, 1½, 3 in. to the foot. Per set..... 14.25

No. 2622 Set of 12 Boxwood Scales, 18 in., divided ⅛, ¼, ½, 1, ⅜, ¾, 1½, 2, 3, 4, 6, 12 in. to the foot. Per set..... 21.00

FULL DIVIDED OR CHAIN SCALES

The Scales contained in set No. 2624 have two different divisions, one on each edge, each of which is numbered to read both ways.

No. 2624 Set of 4 Boxwood Scales, 12 in., divided 10, 20, 30, 40, 50, 60, 80, 100 parts to the inch. Per set..... $4.70

The Scales contained in sets Nos. 2626 and 2628 have the same division on both edges and are numbered to read both ways on each edge.

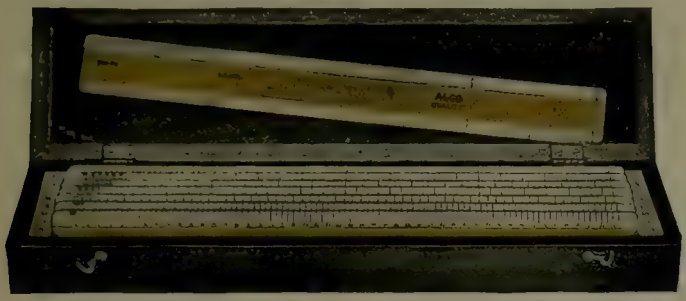
No. 2626 Set of 6 Boxwood Scales, 12 in., divided 10, 20, 30, 40, 50, 60 parts to the inch. Per set..... 6.00

No. 2628 Set of 8 Boxwood Scales, 12 in., divided 10, 20, 30, 40, 50, 60, 80, 100 parts to the inch. Per set..... 9.00

Metric Scales in sets, see page 405.

FLAT WHITE-EDGE SCALES IN SETS

In partitioned mahogany boxes, highly polished and well made.



OPEN DIVIDED SCALES

These Scales have the same division on both edges, one edge reading from left to right, the other edge from right to left.

No. 2634 Set of 4 White-Edge Scales, 12 in., divided ⅛, ¼, ½, 1 in. to the foot..... $6.25

No. 2638 Set of 8 White-Edge Scales, 12 in., divided ⅛, ¼, ½, 1, ⅜, ¾, 1½, 3 in. to the foot..... 11.50

No. 2642 Set of 12 White-Edge Scales, 12 in., divided ⅛, ¼, ½, 1, ⅜, ¾, 1½, 2, 3, 4, 6, 12 in. to the foot..... 17.00

No. 2644 Set of 4 White-Edge Scales, 18 in., divided ⅛, ¼, ½, 1 in. to the foot..... 10.75

No. 2648 Set of 8 White-Edge Scales, 18 in., divided ⅛, ¼, ½, 1, ⅜, ¾, 1½, 3 in. to the foot..... 20.25

No. 2652 Set of 12 White-Edge Scales, 18 in., divided ⅛, ¼, ½, 1, ⅜, ¾, 1½, 2, 3, 4, 6, 12 in. to the foot..... 30.00

FULL DIVIDED OR CHAIN SCALES

The Scales contained in set No. 2654 have two different divisions, one on each edge, each of which is numbered to read both ways.

No. 2654 Set of 4 White-Edge Scales, divided 10, 20, 30, 40, 50, 60, 80, 100 parts to the inch..... $6.75

The Scales contained in sets Nos. 2656 and 2658 have the same division on both edges, and are numbered to read both ways on each edge.

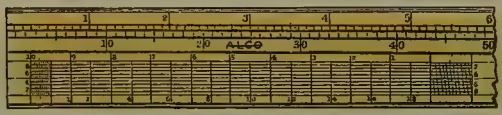
No. 2656 Set of 6 White-Edge Scales, divided 10, 20, 30, 40, 50, 60 parts to the inch..... 9.00

No. 2658 Set of 8 White-Edge Scales, divided 10, 20, 30, 40, 50, 60, 80, 100 parts to the inch..... 13.00

Metric Scales in sets, see page 405.

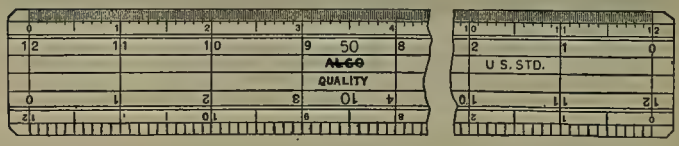
For prevailing prices see latest supplementary price list.

PLOTTING SCALES



No. 2660 Boxwood Plotting Scale, 6 in..... $0.15
No. 2661 Ivory Plotting Scale, 6 in..... .90

TRANSPARENT AMBER UNDERWRITERS' SCALES
Regular Shape



No. 2663

No. 2663 Flat Transparent Amber Underwriters' Scale, 6 in., divided 10x50 parts to inch $1.50
No. 2664, same as No. 2594 but 12 in..... 2.00

PAPER SCALES

Printed on Bristol Board, engine divided.

No. 2665 Cardboard Scales, 18 in. long, full divided in either ⅛, ¼, ⅜, ½, ¾, 1, 1½, or 3 inches to the foot. Per set of these 8 scales..... $1.50
Single Scales. Each ..... .20

No. 2666 Cardboard Scales, 18 in. long, full divided in either 10, 20, 30, 40, 50, or 60 parts to the inch. Per set of these 6 scales.... 1.10
Single Scales. Each ..... .20

No. 2667 Metric Paper Scales, ½ meter long, divided in mm. Each.. .20

No. 2668 Metric and inch comparing Scale, ½ meter long. Each.... .30

No. 2669 Scale of proportional inches, 12 in. long, divided ⅛, ¼, ½ and 1 inch. Each ..... .10

For prevailing prices see latest supplementary price list.

WOOD DESK RULES

These Desk Rules are a strictly high-grade article, nicely finished in natural color, highly polished, and should not be compared with the many cheaper and inferior grades on the market.

Nos. 2670-71

Graduated Inches and 16ths.

	12 in.	15 in.	18 in.
No. 2670 Maple, plain edge	$0.10	$0.15	$0.20
No. 2671 Boxwood, plain edge	.50	.55	.60

Nos. 2672-73

Graduated Inches and 16ths.

	12 in.	15 in.	18 in.
No. 2672 Maple, two inlaid brass edges	$0.25	$0.30	$0.35
No. 2673 Boxwood, two inlaid brass edges	.60	.80	.95

YARD STICKS

Polished.

Nos. 2676-77

Graduated one side Inches and 8ths, other side Fractions of Yards.

No. 2676 Maple, plain, 1x1/4 in. Each	$0.20
No. 2677 Maple, brass tipped, 1x1/4 in. Each	.30

METER STICKS

Polished

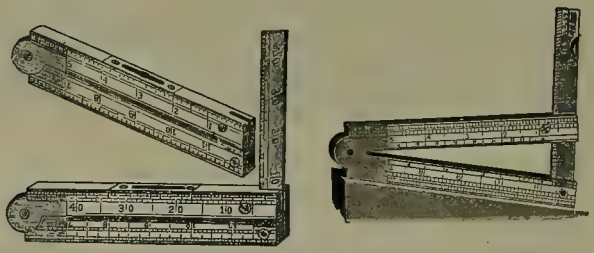
Nos. 2678-79

Graduated both sides, one side upper edge only, Inches and 8ths; other side, both edges to Millimeters.

No. 2678 Maple, plain, 1x1/8 in. Each	$0.35
No. 2679 Maple, brass tipped, 1x1/8 in. Each	.45

CLINOMETER RULE

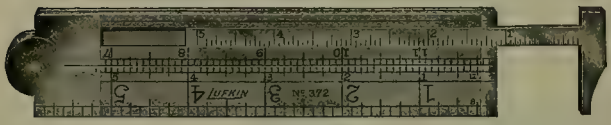
12 Inch. Two Fold.



No. 2680

No. 2680 Clinometer Rule, boxwood, full bound, combines carpenter's rule, spirit level, inclinometer or slope level, square, plumb, drafting scale, brace scale, T square, and protractor. Each $2.00

BOXWOOD CALIPER RULES



No. 2686

No. 2685—6 in., 2 fold, unbound; graduated 8, 10, 12 and 16ths. Each $0.45
No. 2686—1 ft., 2 fold, unbound; graduated 8, 10, 12 and 16ths. Each .65
No. 2687—2 ft., 4 fold, full bound; graduated 8, 10, 12, 16ths. Each.. 1.35

No. 2691

LUMBER GAUGES

For measuring thickness of lumber. Made of nicely finished aluminum, very light and convenient.

No. 2690—1, 1¼, 1½, 1¾, 2 inches. Each..... $0.60
No. 2691—⅜, ½, ⅝, ¾, ⅞, 1, 1¼, 1½, 1¾, 2 inches. Each..... .60
No. 2692—⅝, ¾, 1, 1¼, 2, 2½ inches. Each..... .65

For prevailing prices see latest supplementary price list.

MAPLE EXTENSION RULES

Extension Rules are especially adapted for quickly and accurately measuring the distance between fixed points (floor and ceiling, window frames, etc.). They are high grade, and the best and most convenient of their kind.

In Two Sections, with Set Screws

Fitted with steel springs to keep the sliding joints at any desired point. Graduated feet, inches and 8ths.

No. 2702—2 ft., extending to 4 ft.	Each	$1.80
No. 2703—3 ft., extending to 6 ft.	Each	2.15
No. 2704—4 ft., extending to 8 ft.	Each	2.50
No. 2706—6 ft., extending to 12 ft.	Each	3.60
No. 2708—8 ft., extending to 16 ft.	Each	4.50

In Three Sections, with Set Screws

For convenience in measuring, the three section rules are graduated on one side only in feet, inches and 8ths. Fitted with our patent locking device, which automatically holds the sliding joints in their proper place, enabling one to instantly arrive at the correct measurement and avoiding all the confusion incident to other rules of this class.

No. 2713—3 ft., extending to 9 ft.	Each	$4.50
No. 2714—4 ft., extending to 12 ft.	Each	5.40
No. 2715—5 ft., extending to 15 ft.	Each	6.60

See "Interlox" Sliding Rule, listed on page 420.

ARCHITECTS' RULES

With inside edges beveled.

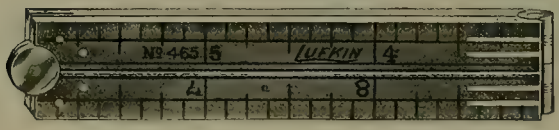
No. 2721

No. 2720	Boxwood, 2 ft., 4 fold, graduated 8, 10, 12 and 16ths, with drafting scales. Each	$0.90
No. 2721	Ivory, 2 ft., 4 fold, graduated 8, 10, 12 and 16ths, with drafting scales. Each	8.00
No. 2721½, same as No. 2721, but graduated on outside edges in 100ths of a foot. Each		8.25

For prevailing prices see latest supplementary price list.

ONE FOOT BOXWOOD RULES

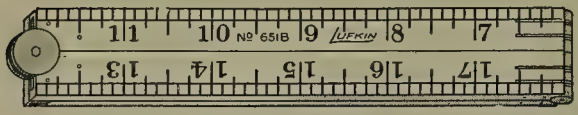
Unbound. Four Fold



No. 2725—1 ft., 4 fold, 5/8 in. wide, unbound; graduated 8ths and 16ths, Each $0.20

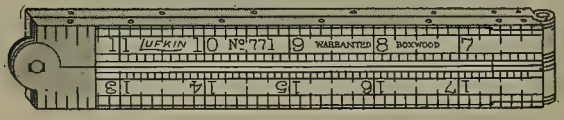
TWO FOOT BOXWOOD RULES

Unbound. Four Fold



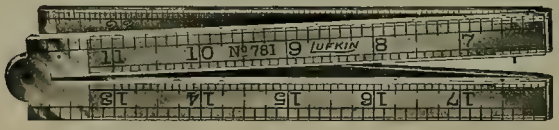
No. 2726—2 ft., 4 fold, 1 in. wide, unbound; graduated 8ths and 16ths. Each $0.25

Half Bound. Four Fold



No. 2727—2 ft., 4 fold, 1 in. wide, half bound; graduated 8, 10, 12 and 16ths. Each $0.65

Full Bound. Four Fold



No. 2728—2 ft., 4 fold, 1 in. wide, full bound; graduated 8, 10, 12 and 16ths. Each $0.80

No. 2728½, same as No. 2728, graduated 10ths and 100ths of a foot, and 10ths and 16ths of inches. Each..... 1.00

For prevailing prices see latest supplementary price list.

FLEXIBLE SPRING JOINT RULES

Hardwood, Yellow and White Finish, 5/8 In. Wide

These Pocket Rules are thin and light, and provided with spring joints so that they may be held in a straight line when open. They are made of strong material, and heavily coated, and the ends are provided with metal tips.

Yellow Enamel			White Enamel		
Marked Consecutive Inches, divided in 16ths.					
No. 2732—2 ft.	Each.....	$0.20	No. 2732W—2 ft.	Each....	$0.20
No. 2733—3 ft.	Each.....	.30	No. 2733W—3 ft.	Each....	.35
No. 2734—4 ft.	Each.....	.40	No. 2734W—4 ft.	Each....	.45
No. 2735—5 ft.	Each.....	.50	No. 2735W—5 ft.	Each....	.55
No. 2736—6 ft.	Each.....	.60	No. 2736W—6 ft.	Each....	.65
No. 2738—8 ft.	Each.....	.80	No. 2738W—8 ft.	Each....	.90
Marked Feet and Inches, divided in 16ths.					
No. 2743—3 ft.	Each.....	$0.30	No. 2743W—3 ft.	Each....	$0.35
No. 2744—4 ft.	Each.....	.40	No. 2744W—4 ft.	Each....	.45
No. 2745—5 ft.	Each.....	.50	No. 2745W—5 ft.	Each....	.55
No. 2746—6 ft.	Each.....	.60	No. 2746W—6 ft.	Each....	.65
No. 2748—8 ft.	Each.....	.80	No. 2748W—8 ft.	Each....	.90
Marked Feet and Inches one side, Feet, 10ths and 100ths other side.					
No. 2754—4 ft.	Each.....	$0.40	No. 2754W—4 ft.	Each....	$0.45
No. 2755—5 ft.	Each.....	.50	No. 2755W—5 ft.	Each....	.55
No. 2756—6 ft.	Each.....	.60	No. 2756W—6 ft.	Each....	.65
Marked Consecutive Inches one side, Metric to Millimeters other side.					
No. 2762—2 ft.	Each.....	$0.20	No. 2762W—2 ft.	Each....	$0.20
No. 2763—3 ft.	Each.....	.30	No. 2763W—3 ft.	Each....	.35
No. 2764—4 ft.	Each.....	.40	No. 2764W—4 ft.	Each....	.45
No. 2766—6 ft.	Each.....	.60	No. 2766W—6 ft.	Each....	.65

For prevailing prices see latest supplementary price list.

VEST POCKET SPRING JOINT RULES

Hardwood, yellow and white finish, 3/8 in. wide.

These Rules are similar to Rules Nos. 2732-66 but smaller. The joints are but 4 inches long, and therefore more convenient for the pocket. The accuracy of the graduations is the same as on the larger rules.

Yellow Enamel			White Enamel		
Marked Consecutive Inches, divided in 16ths.					
No. 2772—2 ft.	Each.....	$0.25	No. 2772W—2 ft.	Each.....	$0.45
No. 2773—3 ft.	Each.....	.40	No. 2773W—3 ft.	Each.....	.55
Marked Feet, 10ths and 100ths on Both Sides.					
No. 2782—2 ft.	Each.....	$0.25	No. 2782W—2 ft.	Each.....	$0.45
Marked Consecutive Inches one side, Metric to Millimeters other side.					
No. 2781M—1 meter.	Each.	$0.55	No. 2781MW—1 meter.	Ea.	$0.70

THE "INTERLOX" SLIDE RULE

The Interlox Sliding Rule combines a rule for lineal measurements with a direct reading inside caliper rule. When closed, all the slides are locked together with an interlocking device. The first slide, when pulled out, releases the second slide, the second releases the third, and so on. This interlocking device makes it impossible to make any error in taking measurements as the slides cannot be extended or closed except in consecutive order. The closing is effected by pressing a key spring on the first slide which releases the second, the second the third, etc., until closed.

Illustration shows rule in position for taking inside measurements. A direct reading of the distance between the two extreme points of the rule is obtained where indicated by arrow.

Made of selected boxwood, finished with waterproof lacquer, with brass trimmings.

Marked Inches, divided in 16ths.

No. 2792—2 ft.	Each	$0.40
No. 2793—3 ft.	Each	.60
No. 2794—4 ft.	Each	.80
No. 2795—5 ft.	Each	1.00
No. 2796—6 ft.	Each	1.20
No. 2798—8 ft.	Each	1.60

Marked Metric, divided to millimeters.

No. 2791M—1 meter.	Each	$0.70
No. 2791½M—1½ meters.	Each	1.00
No. 2792M—2 meters.	Each	1.35

Maple Extension Rules, see page 417.

For prevailing prices see latest supplementary price list.

FOLDING FLEXIBLE STEEL POCKET RULES

With Patent Stop Joints

No. 2801

Three-eighths inch wide, flexible spring steel. Raised figures. With patent stop joints that hold rule true and rigid when extended.

Marked Consecutive Inches, divided in 16ths.

No. 2801—1 ft. 4 in. joints.	Each	$0.40
No. 2802—2 ft. 4 in. joints.	Each	.75
No. 2803—3 ft. 4 in. joints.	Each	1.10

Marked Inches and 16ths one side, Feet, 10ths and 100ths other side.

No. 2811—1 ft. 4 in. joints.	Each	$0.40
No. 2812—2 ft. 4 in. joints.	Each	.75
No. 2813—3 ft. 4 in. joints.	Each	1.10

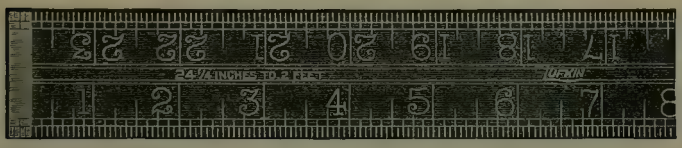
Marked Inches and 16ths one side, Millimeters other side.

No. 2821—1 ft. 4 in. joints.	Each	$0.40
No. 2822—2 ft. 4 in. joints.	Each	.75
No. 2823—3 ft. 4 in. joints.	Each	1.10

METAL BOUND LEATHER CASES FOR STEEL POCKET RULES

No. 2831 Leather Case for 1 ft. 4 in. joint rule.	Each	$0.15
No. 2832 Leather Case for 2 ft. 4 in. joint rule.	Each	.20
No. 2833 Leather Case for 3 ft. 4 in. joint rule.	Each	.25

HARDWOOD SHRINKAGE RULES



These Shrinkage Rules are strictly high grade in every respect. Guaranteed accurate, and the finest Shrinkage Rules made, and should not be compared with the cheaper and inferior rules on the market.

Made of Highly Finished Boxwood, 1½x⅛ inch, Brass Capped.

Graduated 8ths, 10ths, 12ths and 16ths.

No. 2840—Extreme length	24¼	inches. Shrinkage	1/16	inch per foot					Each	$1.50
No. 2841— " "	24 2/12	" "	1/12	" " "					"	1.50
No. 2842— " "	24 2/10	" "	1/10	" " "					"	1.50
No. 2843— " "	24 3/16	" "	3/32	" " "					"	1.50
No. 2844— " "	24¼	" "	⅛	" " "					"	1.50
No. 2845— " "	24⅜	" "	3/16	" " "					"	1.50
No. 2846— " "	24½	" "	¼	" " "					"	1.50
No. 2847— " "	24⅝	" "	5/16	" " "					"	1.50

For prevailing prices see latest supplementary price list.

PARALLEL RULES

Ebony, Nickel-Plated Bars

No. 2860— 6 in.	Each	$0.30
No. 2861— 9 in.	Each	.60
No. 2862—12 in.	Each	.75
No. 2863—15 in.	Each	.90
No. 2864—18 in.	Each	1.20
No. 2865—24 in.	Each	1.80

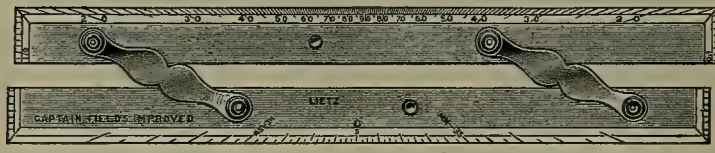
Black Amber, Nickel-Plated Bars

No. 2870— 6 in.	Each	$0.75
No. 2871— 9 in.	Each	.90
No. 2872—12 in.	Each	1.20
No. 2873—15 in.	Each	1.50
No. 2874—18 in.	Each	1.80
No. 2875—24 in.	Each	2.40

Transparent Amber, Nickel-Plated Bars

No. 2880— 6 in.	Each	$1.35
No. 2881— 9 in.	Each	1.80
No. 2882—12 in.	Each	2.40
No. 2883—15 in.	Each	3.00
No. 2884—18 in.	Each	3.75
No. 2885—24 in.	Each	4.00

CAPTAIN FIELD'S IMPROVED PARALLEL RULER



No. 2890B	Captain Field's Parallel Ruler, 18 in., boxwood	$3.50
No. 2890E	Captain Field's Parallel Rules, 18 in., ebony	3.50
No. 2891B	Captain Field's Parallel Ruler, 24 in., boxwood	4.50
No. 2891E	Captain Field's Parallel Ruler, 24 in., ebony	4.50

For prevailing prices see latest supplementary price list.

ROLLING PARALLEL RULES

Ebony, Nickel-Plated Mountings

No. 2901— 9 in. Each	$2.75
No. 2902—12 in. Each	3.25
No. 2903—15 in. Each	4.00
No. 2904—18 in. Each	5.00

Hard Rubber, Nickel-Plated Mountings

No. 2911— 9 in. Each	$4.00
No. 2912—12 in. Each	4.50
No. 2913—15 in. Each	5.50
No. 2914—18 in. Each	6.50

Boxwood, Nickel-Plated Mountings

White edges, divided ⅛, ¼, ½, 1 inch to the foot.

No. 2922—12 in. Each	$4.50
No. 2923—15 in. Each	6.50
No. 2924—18 in. Each	7.50

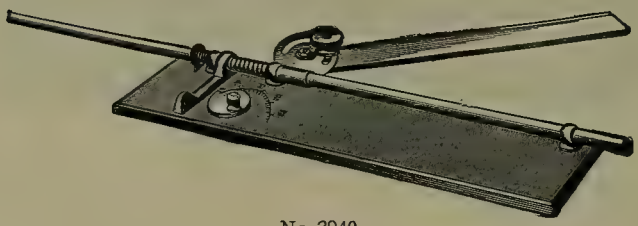
Brass, Heavily Nickel-Plated

No. 2931— 9 in., weight about 24 oz. Each	$7.25
No. 2932—12 in., weight about 32 oz. Each	8.50
No. 2933—15 in., weight about 40 oz. Each	10.00
No. 2934—18 in., weight about 54 oz. Each	12.00
No. 2935—24 in., weight about 72 oz. Each	18.00

Our Brass, Nickel-Plated Rolling Parallel Rulers are considerably heavier than the others. The greatest accuracy of motion is assured. Each packed in a plain wooden box.

For prevailing prices see latest supplementary price list.

SECTION LINERS



No. 2940

No. 2940 Practical Section Liner, hardwood with nickel-plated mountings and 7 in. Amber Rule, in imitation morocco case $1.75

No. 2941, same as No. 2940 but with wooden rule instead of amber.. 1.50

Section Liners Nos. 2940 and 2941 are strong, simple and durable. They retain their place on the board by means of pins in the bottom of the base. The range of work is great, allowing spaces from 1/100 to ½ inch at any angle without changing position.

TERRY'S SECTION LINER

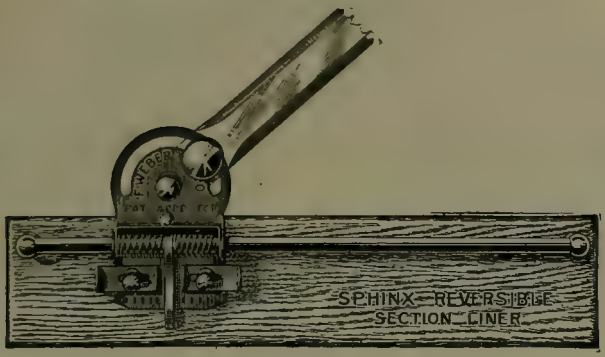
No. 2945

No. 2945 Terry's Section Liner, heavy metal base plate with pins on bottom, nickel-plated mountings and 7 in. mahogany amber lined rule, in imitation morocco case..... $5.00

No. 2946, same as No. 2945 but with 12 in. mahogany amber lined rule, with brace attachment 6.50

For prevailing prices see latest supplementary price list.

REVERSIBLE SECTION LINER

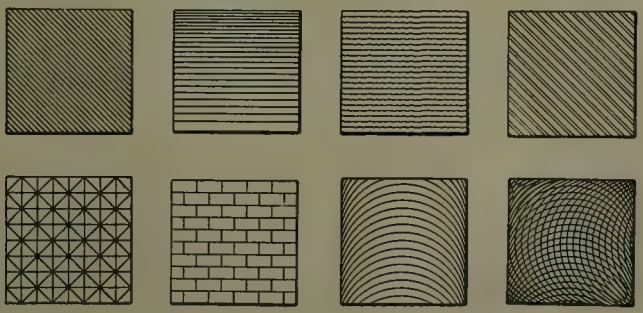


No. 2948

No. 2948 Reversible Section Liner, hardwood with nickel-plated mountings and 7 in. amber rule, in imitation morocco case.. $2.25
No. 2949, same as No. 2948 but with 15 in. amber rule..... 2.50

Section Liners Nos. 2948 and 2949 are called **Reversible** because they operate both from left to right and from right to left. The bar is stationary and the whole liner occupies but a space on the drawing board 8¾ in. long. The arm is perfectly rigid. An extra strong steel spring clutches the carriage firmly at any point along the bar, so that there is positively no lost motion in any of its parts, although the pinching together of either left or right post and the lever forces it evenly and smoothly forward the distance of the setting. In operating, let us say from left to right, bring the car, by means of pressure, to the left-hand end of the base. Set the left indicator to the desired spacing, clamp firmly. Place the forefinger of the left hand on the knurled knob, the thumb on the lever. Press together, releasing first forefinger, then the thumb. In reversing, or in this case, operating from right to left, set to the desired spacing, by means of the right-hand indicator, and proceed as before.

Samples of Work.



For prevailing prices see latest supplementary price list.

SLIDE RULES

The Slide Rule is an indispensable aid to anyone who in his business is called upon to make calculations. The principles with which one must be familiar are few and simple and are easily mastered with little practice.

Abstract from Kent's Mechanical Engineers' Pocket Book, 9th Edition, 1916.

The slide rule is based on the principles that the addition of logarithms multiplies the numbers which they represent, and subtracting logarithms divides the numbers. By its use the operations of multiplication, division, the finding of powers and the extraction of roots, may be performed rapidly and with an approximation to accuracy which is sufficient for many purposes. With a good 10-inch Mannheim rule the results obtained are usually accurate to $\frac{1}{2}$ of 1 per cent. Much greater accuracy is obtained with cylindrical rules like the Thacher.

The rule consists of a fixed and a sliding part both of which are ruled with logarithmic scales; that is, with consecutive divisions spaced not equally, as in an ordinary scale, but in proportion to the logarithms of a series of numbers from 1 to 10. By moving the slide to the right or left the logarithms are added or subtracted, and multiplication or division of the numbers thereby effected. The scales on the fixed part of the rule are known as the *A* and *D* scales, and those on the slide as the *B* and *C* scales. *A* and *B* are the upper and *C* and *D* are the lower scales. The *A* and *B* scales are each divided into two, left hand and right hand, each being a reproduction, one half the size, of the *C* and *D* scales. A "runner," which consists of a framed glass plate with a fine vertical line on it, is used to facilitate some of the operations. The numbering on each scale begins with the figure 1, which is called the "index" of the scale. In using the scale the figures 1, 2, 3, etc., are to be taken either as representing these numbers, or as 10, 20, 30, etc., 100, 200, 300, etc., 0.1, 0.2, 0.3, etc., that is, the numbers multiplied or divided by 10, 100, etc., as may be most convenient for the solution of a given problem.

The following examples will give an idea of the method of using the slide rule.

Proportion.—Set the first term of a proportion on the *C* scale opposite the second term on the *D* scale, then opposite the third term on the *C* scale read the fourth term on the *D* scale.

EXAMPLE.—Find the fourth term in the proportion $12 : 21 :: 30 : z$. Move the slide to the right until 12 on *C* concides with 21 on *D*, then opposite 30 on *C* read z on $D = 52.5$. The *A* and *B* scales may be used instead of *C* and *D*.

Multiplication.—Set the index or figure 1 of the *C* scale to one of the factors on *D*.

EXAMPLE.—25×3. Move the slide to the right until the left index of *C* coincides with 25 on the *D* scale. Under 3 on the *C* scale will be found the product on the *D* scale, $= 75$.

Division.—Place the divisor on *C* opposite the dividend on *D*, and the quotient will be found on *D* under the index of *C*.

EXAMPLE.—$750 \div 25$. Move the slide to the right until 25 on *C* coincides with 750 on *D*. Under the left index of *C* is found the quotient on D, $= 30$.

Combined Multiplication and Division.—Arrange the factors to be multiplied and divided in the form of a fraction with one more factor in the numerator than in the denominator, supplying the factor 1 if necessary. Then perform alternate division and multiplication, using the runner to indicate the several partial results.

EXAMPLE.—$\frac{4 \times 5 \times 8}{3 \times 6} = 8.9$ nearly. Set 3 on *C* over 4 on *D*, set runner to 5 on *C*, then set 6 on *C* under the runner, and read under 8 on *C* the result 8.9 — on *D*.

Involution and Evolution.—The numbers on scales *A* and *B* are the squares of their coinciding numbers on the scales *C* and *D*, and also the numbers on scales *C* and *D* are the square roots of their coinciding numbers on scales *A* and *B*.

EXAMPLE.—$4^2 = 16$. Set the runner over 4 on scale *D* and read 16 on *A*.

$\sqrt{16} = 4$. Set the runner over 16 on *A* and read 4 on *D*.

In extracting square roots, if the number of digits is odd, take the number on the left-hand scale of *A*; if the number of digits is even, take the number on the right-hand scale of *A*.

To cube a number, perform the operations of squaring and multiplication.

EXAMPLE.—$2^3 = 8$. Set the index of *C* over 2 on *D*, and above 2 on *B* read the result 8 on *A*.

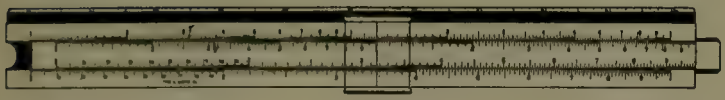
Extraction of the Cube Root.—Set the runner over the number on *A*, then move the slide until there is found under the runner on *B*, the same number which is found under the index of *C* on *D*; this number is the cube root desired.

EXAMPLE.—$\sqrt[3]{8} = 2$. Set the runner over 8 on *A*, move the slide along until the same number appears under the runner on *B* and under the index of *C* on *D*; this will be the number 2.

Trigonometrical Computations.—On the under side of the slide (which is reversible) are placed three scales, a scale of natural sines marked *S*, a scale of natural tangents marked *T*, and between these a scale of equal parts. To use these scales, reverse the slide, bringing its under side to the top. Coinciding with an angle on *S* its sine will be found on *A*, and coinciding with an angle on *T* will be found the tangent on *D*. Sines and tangents can be multiplied or divided like numbers.

MANNHEIM SLIDE RULES

Best Quality **Adjustable**



These Rules are engine divided on white celluloid facings. The divisions are clear, distinct, permanent and accurate.

No. 2960—5-inch Mannheim Rule in sewed leather case, with instructions. Each $4.50

This Rule is subdivided as closely as the 10-inch Rule No. 2964.

No. 2962—8-inch Mannheim Rule in sewed leather case with instructions. Each 4.50

This Rule is subdivided as closely as the 10-inch Rule No. 2964.

No. 2964—10-inch Mannheim Rule in morocco case, with instructions. Each 4.50

No. 2965—10-inch Mannheim Rule, like No. 2964 but subdivided as closely as the 20-inch Rule, in morocco case, with instructions. Each 8.00

No. 2967—16-inch Mannheim Rule in morocco case, with instructions. Each 10.00

This rule is subdivided as closely as the 20-inch Rule No. 2969.

No. 2969—20-inch Mannheim Rule in morocco case, with instructions. Each 12.50

Rules Nos. 2965, 2967 and 2969 have from 200 to 20 subdivisions between the prime numbers, while the shorter rules have from 100 to 10, therefore the reading is closer by at least one figure.

No. 3060H Glass Indicator with two hairlines instead of one, add.... .20

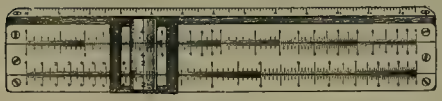
For complete line of Indicators, Instruction Books, and Slide Rule Accessories see pages 432 and 433.

For prevailing prices see latest supplementary price list.

MANNHEIM SLIDE RULES

Best Quality.

THE JUNIOR SLIDE RULE

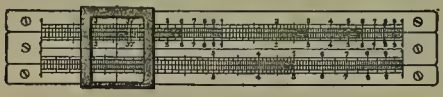


No. 2970

No. 2970 Junior Mannheim Slide Rule, 5 in. long, mahogany stock with white celluloid facings. Graduations engine divided, with magnifier. In sewed leather case with instructions $4.50

The Junior Mannheim Slide Rule No. 2970 combines the accuracy of a regular 10-inch slide rule with the convenience afforded by its compactness. The subdivisions are as fine as those on a regular 10-inch rule, and by means of a neat but powerful magnifying glass attached to the indicator their value is easily ascertained with the same degree of accuracy as can be obtained on the larger rule.

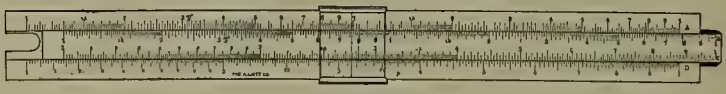
THE VEST POCKET SLIDE RULE



No. 2973

No. 2973 Vest Pocket Slide Rule, 5 in. long, thin mahogany stock with white celluloid facings. Narrow for pocket use. Complete with indicator, case and instructions $2.50

ECONOMY SLIDE RULES



No. 2974

No. 2974 Economy (Mannheim) Slide Rule, 10 inches long, divisions on white celluloid facings. Complete with indicator, case and instructions..... $3.50

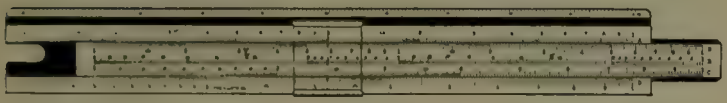
The Economy Slide Rule is of the same pattern as Mannheim Slide Rule No. 2964 but is not adjustable. The A and D scales are attached to a flexible back made of a similar material as the face of the slide and scales. This construction insures a uniform expansion and contraction under all atmospheric conditions.

For Slide Rule Accessories see pages 432 and 433.

For prevailing prices see latest supplementary price list.

THE POLYPHASE SLIDE RULE

Best Quality **Adjustable**



The Polyphase Slide Rule has in addition to the regular scales of the Mannheim Rule a scale of cubes on the edge of the rule and an inverted scale through the center of the slide. These scales may be used in connection with the others, by means of the indicator. The inverted scale enables taking three factors at one setting of the slide, and reading reciprocals by means of the indicator. Almost any combination of three factors involving square, square root, cube and cube root may be solved at one setting of the slide.

Rules are engine divided on white celluloid facings. The divisions are clear, distinct, permanent and accurate.

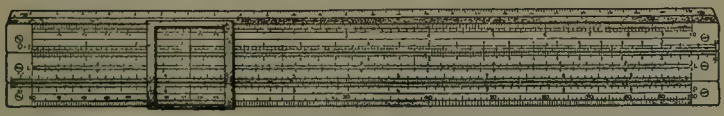
No. 2982—8-inch Polyphase Rule in sewed leather case, with instructions. Each $5.00

No. 2984—10-inch Polyphase Rule in morocco case, with instructions. Each 5.00

No. 2985—10-inch Polyphase Rule like No. 2984, but subdivided as closely as the 20-inch Rule, in morocco case, with instructions. Each 8.50

No. 2989—20-inch Polyphase Rule in morocco case, with instructions. Each 14.00

THE PRECISION SLIDE RULE



The Precision Slide Rules are similar to other Mannheim Slide Rules, but the results obtained are of a considerably greater accuracy. The increase in accuracy is obtained by making the scale length of the logarithmic unit equal to 50 cm. instead of 12.5 cm or 25 cm. The scale is not, however, made in one length of 50 cm. but in two lengths of 25 cm. each. All the other scales, including those on the back of the slide, are based on the scale length of 50 cm.; so that all calculations with this slide rule have a uniform and considerably greater degree of accuracy than those made with the ordinary slide rule.

Rules are engine divided on white celluloid facings. The divisions are clear, distinct, permanent and accurate.

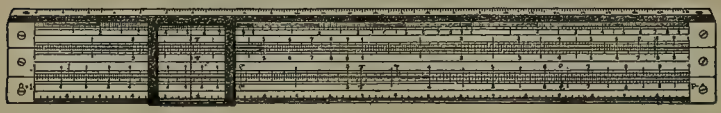
No. 2994—10-inch Precision Slide Rule in morocco case, with instructions. Each $6.50

No. 2999—20-inch Precision Slide Rule in morocco case, with instructions. Each 20.00

For Slide Rule Accessories see pages 432 and 433.

For prevailing prices see latest supplementary price list.

THE ALCO SLIDE RULE



This Slide Rule differs from those hitherto ordinarily employed in that it has on its front face not only the four middle scales (two on the rule A and D; and two on the slide B and C), but also two other scales, viz., an evenly divided scale E, on the lower margin, and a logarithmic scale F, at the top, the latter consisting of three similar scales, placed consecutively.

By this arrangement, logarithms, cubes and cube roots can be directly and easily determined. With the ordinary slide rules these calculations, especially the extraction of cube roots, are somewhat complicated, and necessitate the use of the slide.

All calculations such as multiplication, division, involution, evolution, etc., are carried out with the first mentioned scales, A, B, C, D.

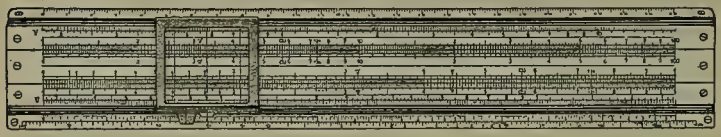
Engine divided on white celluloid facings. The divisions are clear, distinct, permanent and accurate.

No. 3024—10-inch Alco Slide Rule, in morocco case with instructions. Each $5.00

No. 3026—15-inch Alco Slide Rule, in morocco case with instructions. Each 12.00

No. 3029—20-inch Alco Slide Rule, in morocco case with instructions. Each 15.00

THE ELECTRIC SLIDE RULE



Especially evolved in response to a demand for a suitable Slide Rule for Electrical Engineers and for students in Electro-Technology.

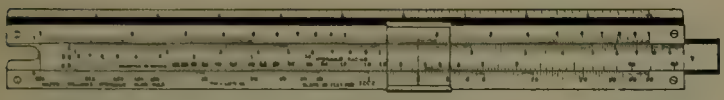
Serves in an excellent manner the facility of calculation of all electro-technological problems. The table of constants, on the reverse of the rule, makes the reference to hand-books almost superfluous.

Engine divided on white celluloid facings. The divisions are clear, distinct, permanent and accurate.

No. 3034—10-inch Electric Slide Rule, in morocco case with directions. Each $5.50

For Slide Rule Accessories see pages 432 and 433.

HAZEN-WILLIAMS HYDRAULIC SLIDE RULE



No. 3044

The Hazen-Williams Hydraulic Slide Rule is used principally for determining the velocity and quantity of the flow of water in pipes and channels, but is also adapted for ordinary slide rule calculations. Special computations may also be solved by its use, as, for instance, to determine the corresponding flow at any other slope or head, when the flow of water through a pipe or system of pipes produced by a given slope or head is known; to find what size of pipe must be used to produce the same discharge for any other slope, when the discharge in a given size of pipe at a given slope is known; to compute the discharge through a compound pipe, that is, a pipe of larger diameter connecting with a pipe of smaller diameter, or a series of such pipes; to compute the friction of a given amount of water flowing through two pipes of different diameters and different lengths, freely connected at each end; to get with one setting of the slide the quantity of water corresponding to any slope; to get with one setting of the slide the quantities of water discharged by pipes of different sizes for a given slope and coefficient. In size and general appearance the rule is like an ordinary Mannheim 10-inch slide rule. On the back of the rule are several tables to aid in the convenience of computations to which the rule is applicable. Engine divided on white celluloid facings. The divisions are clear, distinct, permanent and accurate.

No. 3044—10-inch Hazen-Williams Hydraulic Slide Rule, in morocco case with directions $6.00

THE SPITZGLASS SLIDE RULE AND FLOW COMPUTER

The Spitzglass Slide Rule will solve quickly and simply all problems involving the flow of fluids in pipes with a greater amount of accuracy than results obtained by other formulas, as the rule is based on new experimental data. It will also accomplish all ordinary slide rule calculations. The rule is made of solid seasoned white celluloid, fastened to a durable leather folding case, convenient for the pocket. The graduations are engine divided and are clear, distinct, permanent and accurate.

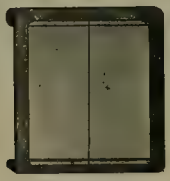
No. 3047 Spitzglass Slide Rule and Flow Computer, 11 inches long, 2½ inches wide, in leather folding case with directions.... $12.50

For Slide Rule Accessories see pages 432 and 433.

For prevailing prices see latest supplementary price list.

SLIDE RULE INDICATORS

Frameless Indicator



Indicator with Aluminum Frame

Indicator with Decimal Pointer No. 3061

When ordering specify style wanted.

No. 3060A For Mannheim Rules Nos. 2960-2965 and 2970 and 2975, each	$0.60
No. 3060B For Mannheim Rules Nos. 2967-2969, each	.80
No. 3060C For Polyphase Rules Nos. 2982-2989, each	1.00
No. 3060D For Precision Rules Nos. 2994-2999, each	1.00
No. 3060E For Alco Slide Rules Nos. 3024-3029, each	1.00
No. 3060F For Electric Slide Rule No. 3044, each	1.00
No. 3060G For Hazen-Williams Slide Rule No. 3048, each	.80
No. 3060H Glass Indicator with two hairlines instead of one, add	.20
No. 3061 Indicator with Decimal Pointer, for any rule, each	1.00

GLASSES ONLY FOR FRAMELESS INDICATORS

No. 3062A For Slide Rules up to and including 10 in. long, each	$0.40
No. 3062B For Slide Rules over 10 in. long, each	.50

Above prices include fitting.

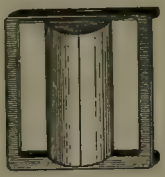
BOOKS ON THE SLIDE RULE

No. 3064 The Mannheim Slide Rule, Complete Manual (furnished with Mannheim Rules), each	$0.50
No. 3065 Instructions for the use of the Slide Rules, published by A. W. Faber, each	.75
No. 3066 "The Use of the Slide Rule," by F. A. Halsey, Fourth Ed., 18 Ill., 7 folding plates, each	.50
No. 3067 "The Slide Rule," by Chas. N. Pickworth. A Practical Manual of Instruction, Fifth Ed. Illustrated, each	1.00
No. 3068 "Solution of Railroad Problems by the Slide Rule," by E. R. Carey, 43 illustrations, each	1.00
No. 3069 "The Slide Rule," by R. G. Blaine. A simple explanation of the theory and use. Illustrated, each	1.00

For prevailing prices see latest supplementary price list.

MAGNIFIERS FOR SLIDE RULES

No. 3071



No. 3072

No. 3070 Detachable Magnifier for Slide Rule Indicator. Each..... $2.00

When ordering please specify for which Slide Rule the Magnifier is wanted.

No. 3071A Indicator with full-size Magnifier for 5-inch Slide Rules. Each 2.50

No. 3071B Indicator with full-size Magnifier for 8, 10, 16 and 20 inch Slide Rules. Each 2.75

No. 3072A Indicator with half-size Magnifier for 5-inch Slide Rules. Each 2.00

No. 3072B Indicator with half-size Magnifier for 8, 10, 16 and 20 inch Slide Rules. Each 2.25

When ordering please specify for which Slide Rule the Indicator is wanted.

CASES FOR SLIDE RULES

No. 3073 Morocco Case for Slide Rules.

Inches long—	5	8	10	16	20
Each	$0.30	$0.35	$0.40	$0.60	$0.80

No. 3074A Sewed Leather Case for Slide Rules.

Inches long—	5	8	10	16	20
Each	$1.00	$1.15	$1.25	$1.50	$2.00

No. 3074B Sewed Leather Case with space for Magnifier.

Inches long—	5	8	10	16	20
Each	$1.70	$1.80	$2.00	$2.50	$3.00

For prevailing prices see latest supplementary price list.

NOTICE

Owing to the large variety of Slide Rules now being offered for varied or special purposes, we have listed only such types as are widely used. We are in position to furnish any type of Slide Rule which may better suit the requirements of our trade.

THE IMPROVED HALDEN CALCULEX

2⅜ inches diameter by ¼ inch thick.

No. 3075

This is a very compact, convenient and accurate instrument and very simple to operate. It is made entirely of metal and its construction is extremely simple, so that it is impossible for the instrument to get out of order.

The book of rules accompanying each instrument is most extensive and complete, yet very clear and easy to understand. It has been arranged so as to fit in a separate compartment of the leather case containing the instrument, so that both together can be conveniently carried in the vest pocket.

The Calculex, briefly described, consists of a disc within a fixed ring, which together form a dial with logarithmic scales on both sides, surrounded by a metal ring and protected on both sides by a glass rim with an indicator hair line marked thereon.

The instrument is operated by turning the disc, holding the nut on either side between finger and thumb. The outside ring is fastened to the rim.

Logs of numbers, squares, square roots, cubes, cube roots, angles, can be read direct from the indicator line, without turning the disc.

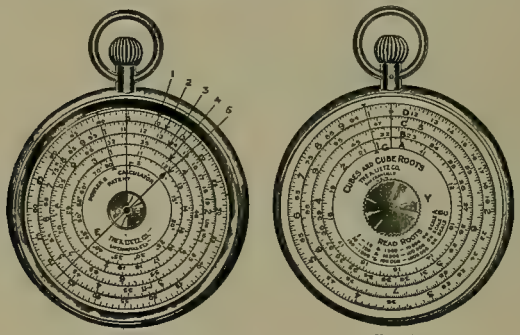
The front face contains five circles of scales. The outer scale No. 1 is a scale of Logs; Nos. 2 and 3 are the calculating scales A and B, Nos. 4 and 5 are the square roots of B scale.

The reverse contains six circles of scales. The outer scale, No. 6, is a scale of angles, Nos. 7 and 8 are calculating scales for reverse proportions, Nos. 9, 10 and 11 are cube roots of scale B.

No. 3075 Halden Calculex Slide Rule, in leather case, with book of instructions. Each $5.00

FOWLER'S POCKET CALCULATOR

About 2¾ inches diameter by ¼ inch thick.



Front Back

No. 3077

With the aid of Fowler's Pocket Calculator any problems of multiplication and division, fractions, squares and square roots, cube and cube roots, logarithms, areas of circles, sines, cosines and tangents of angles, etc., are easily solved. The dials are engine divided, and the instrument is strong, compact and of convenient size for carrying. Full directions accompany each instrument.

No. 3077 Fowler's Pocket Calculator with directions..... $6.50

For prevailing prices see latest supplementary price list.

THE BOUCHER CALCULATOR

About 2 inches diameter by 9/16 inch thick.

Nos. 3080-81

This instrument resembles an ordinary stem-winding watch, with glass-covered dials back and front. Ratios are set off by means of pointers, which, as well as the movable dial, are moved by means of the stem-winder key. Instrument of convenient size to carry in pocket.

No. 3080 Boucher Calculator, silvered metal dials. Each..... $14.00

No. 3081, same as No. 3080 but enameled dial 8.50

SEXTON'S OMNIMETRE

Functions: Logarithms, Numbers, Squares, Square Roots, Cubes, Cube Roots, Sines, Tangents, Versed Sines, Secants.

No. 3084-1 Sexton's Omnimetre No. 1, diam. 7¼ in., Bristol Board Discs, readings from edge of runner. Each..... $1.00

No. 3084-1

No. 3084-2 Sexton's Omnimetre No. 2, diam. 7¼ in., non-absorbent Card Discs, reading from hair-lined runner. Lower disc perforated to facilitate manipulation. Each ... $2.00

No. 3084-3 Sexton's Omnimetre No. 3, diam. 7 in., non-absorbent Bristol Board Discs, readings from hair-lined runner. Lower disc perforated to facilitate manipulation. Milled nut to clamp disc in position when required. Character of graduations gives increased ease of reading. Additional functions, fifth powers and fifth roots. Each... $3.00

No. 3085 Companion Instrument No. 6, diam. 6⅛ in. This instrument consists of a cardboard disc, a transparent disc and a transparent runner. Printed upon the card disc is a logarithmic scale about 13½ feet long, arranged in circles. The instrument is intended as a companion to the Omnimetre (although it will answer as a companion to the straight slide rule as well) for those who wish to read accurately at least four figures in the answers to problems of multiplication and division. Each $2.00

THE ROSS PRECISION COMPUTER

Multiplies—Divides.

Gives Reciprocals.

Solves Proportions.

Handles constant multipliers.

Handles constant divisors.

Handles constant ratios.

Reads 5-place logs and anti-logs.

Solves exponential problems.

Gives 3-place answers instantly.

Solves expressions like $\frac{a \times b \times c \times d}{e \times f \times g \times h}$

With its trigonometric functions many engineers use it for traverses, obtaining 5-place accuracy, about 1 inch per mile.

Operation: $879.65 \times 7.2638 = ?$

Set 87965 under arm 3, clamp;
Set 72638 under arm 4.
Answer 6389.6 is under arm 3.

Slide checks answer—locates decimal.

The Ross Precision Computer is a new multiplier-and-divider of unusual precision. It solves problems like $879.65 \times 72.638 \div 74.769 = 854.58$, with an accuracy of 5 figures, i. e. to an ultimate accuracy of 1/1000 of 1%, or 1 in 100,000.

On the back of the Precision Computer are scales of natural sines, cosines, tangents and cotangents. They read minutes exact, interpolable to fractions of a minute. The Precision Computer is used for figuring earthwork, monthly and final estimates, unit cost and payroll, traverses for final design and reports. It is intended primarily for precise calculations where an accuracy of four to five significant figures is indispensable.

The Precision Computer is made of metal and will last indefinitely. The graduated dial is also mounted on metal. Instrument is nine inches in diameter and weighs one pound.

The Precision Computer is thin, portable, normally held by hand, but for greater convenience the tilted duplex clamp shown in illustration is provided to attach the computer to any desk edge. Instantly attached or detached it greatly enhances operation of the computer. Clamp is finely japanned with polished nickel trimmings.

No. 3090 Ross Precision Computer, complete with leather case and full directions $20.00

No. 3091 Tilted Duplex Clamp for the Ross Precision Computer, extra 2.50

For prevailing prices see latest supplementary price list.

THE ROSS RAPID COMPUTER

Solves expressions like: abc; a/bc; ab tan x; a cos x;
a sin x cos y; ab $\sqrt[3]{c}$; II /180 log a/bc, etc., etc.

The Ross Rapid Computer solves all numerical, trigonometric and logarithmic problems. Its numerical scales correspond to upper scales of a 40-inch slide rule; trigonometric scales correspond to those of 30-inch rule; actually practical for trigonometric work, traverses, stadia, artillery and other engineering problems. Figures quantities, capacity, unit cost, earthwork, payroll, etc., etc.; no blank movements; answer does not run off scale, each movement effective. Has 360° protractor for measuring vertical and horizontal angles. Reads as simply as an ordinary foot rule. Clamped metal arm, especially convenient to lock constants, prevents accidental shifting of scales. Proves its answers by double vernier principle. Not subject to breakage or unequal shrinkage. Eight inches diameter, made of weather and wear-proof celluloid, precise metal centering.

No. 3094 Ross Rapid Computer with sewed leather case and full directions, complete $7.50

Commercial Rapid Computer—The Rapid Computer is also made for commercial use, without technical scales, for figuring payroll, simple and compound interest, discount, freight, profit and loss, prorating, unit costs, foreign exchange, mensuration, weight, in fact any and every calculation involving multiplication and division in any form. Very simple to operate, 8 inches diameter, construction like No. 3094.

No. 3095 Commercial Computer with sewed leather case and full directions, complete $7.50

No. 3096

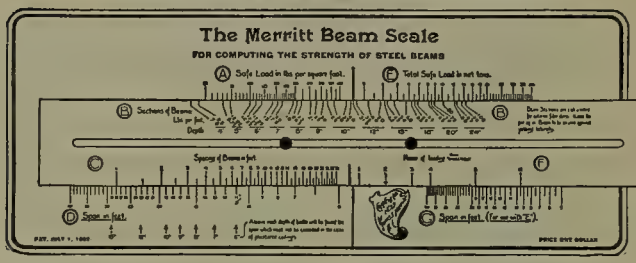
THE MINIATURE RAPID COMPUTER

This instrument is graduated like No. 3094 but is only 3½ inches in diameter. Numbers and scales correspondingly reduced. Made of celluloid, the scales durably protected by a transparent coating. Fits the vest pocket.

No. 3096 Miniature Rapid Computer in soft leather case and full directions ... $2.00

THE MERRITT BEAM SCALE

For computing the strength of steel beams.



No. 3097

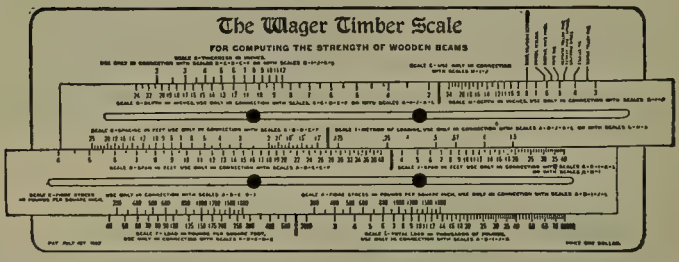
Absolute accurate. Adapted to all conditions. Load, spacing, span, etc., found instantly. Mistakes absolutely eliminated.

The Merritt Beam Scale for computing the strength of steel beams is based on the principle of the Engineer's Slide Rule and was designed to simplify computations of this kind, and to eliminate all chance of errors. Tables and formulæ are absolutely unnecessary when the Merritt Beam Scale is used, and the speed with which answers to widely varying problems may be solved can hardly be appreciated by anyone who has not had the pleasure of using it.

No. 3097 Merritt Beam Scale, on heavy bristol board. Each..... $1.00

THE WAGER TIMBER SCALE

For computing the strength of wooden beams.



No. 3098

For computing the strength of wooden beams. Absolutely accurate. Adapted to all conditions. Load, spacing, span, etc., found instantly. Mistakes absolutely eliminated.

To illustrate the simplicity of the Scale the following is given:

How far apart shall 6 in. x 12 in. timbers of white oak be placed to safely support a load of 150 pounds per square foot, the span being 18 feet, and New York law governing the design?

Select the fibre stress for white oak allowed in New York City (given on back of scale: 1000 pounds). Place 12 in scale B below 6 in scale A. Place 1000 in scale E over 150 in scale F. Above 18 in scale D read 2 ft.-0 in. in scale C.

The Wager Timber Scale, for computing the strength of wooden beams, contains more information than could be given in 500 pages of tables. It is based on the principle of the Engineer's Slide Rule, and five minutes' inspection will convince anyone that it is simplicity itself.

No. 3098 Wager Timber Scale, on heavy bristol board. Each..... $1.00

For prevailing prices see latest supplementary price list.

THACHER'S CALCULATING INSTRUMENT

No. 3100A

No. 3100 Thacher's Calculating Instrument, cylinder 18 in., in polished mahogany box with full directions. Each..... $35.00

No. 3100A Thacher's Calculating Instrument with 3 in. reading glass sliding on brass bar, adjustable to any part of the instrument and for focus. Each..... 45.00

Thacher's Calculating Instrument is a device for performing a great variety of useful arithmetical calculations with rapidity and accuracy. Its operation is simple and readily learned. By its use the tedious drudgery of calculation is avoided and the chance of error eliminated.

As is shown in the illustration, the instrument consists of a cylinder 4 inches in diameter and 18 inches long, which revolves in an open framework composed of 20 angular bars held between two metal rings. The cylinder bears a scale corrsponding to the scale of the Slide Rule, which is duplicated on the exposed sides of the bars. Results can be obtained to the fourth and usually to the fifth place of figures with a surprising degree of accuracy, sufficient for nearly every requirement of the professional or business man. Examples in multiplication, division, proportion, powers or roots involving not more than three quantities, are solved by one operation, and any number of values of an algebraic function composed of two constants and a single variable may generally be found by one setting.

The useful applications of the instrument are almost unlimited; among them may be mentioned finding the stresses and sections in trusses and girders, mensuration, estimates of work and material, solving trigonometrical formulas, making and applying tables, problems in mechanical powers, machinery and hydraulics, problems in simple and compound interest, discount, prorating, the conversion of weights and measures, cost of merchandise with per cent of duty or profit added.

FULLER'S SLIDE RULE

No. 3103

No. 3103 Fuller's Spiral Slide Rule, in mahogany box with directions $30.00

Fuller's Spiral Slide Rule consists of a cylinder which can be moved up or down and turned round a sleeve which is attached to the handle. A single logarithmic scale, 42 feet long, is wound round the cylinder spirally, and ratios are established by means of two pointers or indices, one attached to the handle and the other to an axis which slides in the sleeve.

For prevailing prices see latest supplementary price list.

STADIA COMPUTORS

No. 3104 Cox Stadia Computor $0.75

The Cox Stadia Computor is a circular slide rule of about 15 inches effective length for the reduction of stadia readings. Printed on heavy cardboard, cloth bound, size 6¼x6¼, suitable for carrying in coat pocket.

THE LAMBERT STADIA REDUCER

No. 3105

The use of this Stadia Reducer involves the using of only such vertical angles as may be read without the use of the vernier, and taking the vertical difference and horizontal distance directly from the Reducer slide. Results are given for these angles up to 30 degrees. The height cut on the rod by the middle wire is noted for a correction.

The setting of the telescope to an angle marked by an even division on the arc can be quickly and accurately made with small chance of error, but if desired the observer may mark one side of the arc and let the distinguishing sign appear in the notes. For example, he may mark the minus side red and then an angle of —10° could read red 10°.

The results given by the Reducer are those obtained by the well-known stadia formulæ where S = the stadia distance, V = the measured vertical angle, D = the horizontal distance and H = the distance of elevation to the point sighted on the rod. Then $D = (S + f + c) \cos^2 V$ and $H = (S + f + c) \frac{1}{2} \sin 2 V$. These formulæ are practically correct for vertical heights up to 15° and give results too small from 15° up to 30° by the amounts given in the following table. Horizontal distances are given practically correct up to 30°:

Angle of inclination	15°	20°	23°	25°	27°	29°	30°
Error in vertical heights	0.01	0.02	0.03	0.04	0.05	0.06	0.07

These small quantities may be neglected in practice.

Stadia Reductions

After obtaining the stadia distance either by carefully adjusted wires or by a ratio table previously prepared, add the f + c for obtaining the distance argument to be noted on the top of the Reducer case. Incline the telescope to the nearest division on the vertical arc that will keep the middle wire on the rod, and note the rod reading that the middle wire cuts for a final correction. Pull out the Reducer slide until the angle of arc setting shows just above the case. On this same line on the slide and just above the distance argument on the case find the difference of elevation to the noted rod reading cut by the middle wire. Correct this by the rod reading to obtain the difference of elevation to the station occupied by the rod. Without moving the slide find the horizontal distance on the reverse side.

These tables are also to be used after the manner of using a traverse table. For example: Suppose the distance argument is 962 and the telescope is afterward inclined to an arc reading of —11° at which angle the middle wire cuts the rod at 7.21. A foresight computation would then be as follows:

ON THE FRONT SIDE		ON THE REVERSE SIDE	
For 900	—168.57	For 900	867.2
For 60	—11.24	For 60	57.8
For 2	—0.37	For 2	1.9
Rod reading	—7.21		
Difference in elev. to station	—187.39	Horizontal distance	926.0

The Reducer admits of being used to carry out the decimals further than is shown in the examples if greater accuracy is desired.

No. 3105 Lambert Stadia Reducer No. 1, for use with transit having the vertical circle or arc divided into 30′ spaces, with instructions $2.00

No. 3107 Lambert Stadia Reducer No. 2, for use with transit having vertical circle or arc divided into 20′ spaces, with instructions 2.00

STADIA SLIDE RULES

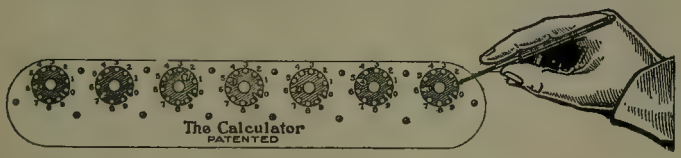
No. 3110 Stadia Slide Rule, engine divided, 10 in., white facing, glass indicator, in morocco case $4.50

No. 3111 Stadia Slide Rule, like No. 3110 but 20 in., in morocco case 12.50

This is a very simple form of Stadia Slide Rule. When the stadia rod reading and elevation of the telescope are known the horizontal distance and vertical height can in every case be obtained at once by one setting (always to the left) of the slide. The rule can also be used for ordinary computations as the under side of the slide has a scale corresponding to the lower scale of the rule and resembling the A and B scale of the ordinary Mannheim rule. Directions are printed on the rule.

No. 3112 Grunsky Stadia Reduction Diagram, paper, horizontal distances to 1000, differences of elevation 100, vertical angles to 30° ..... .50

THE CALCULATOR ADDING MACHINE



No. 3110

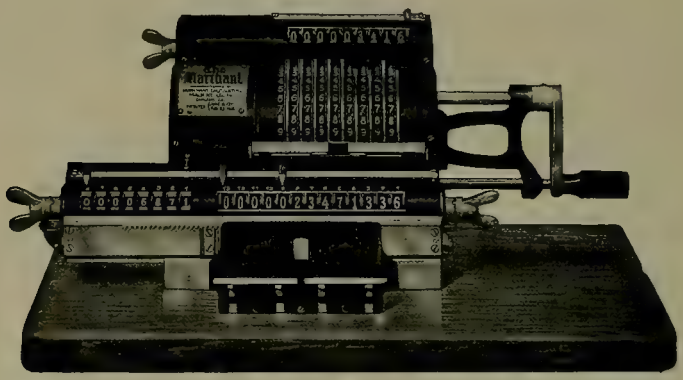
No. 3115 Calculator Adding Machine, complete in heavy pebble-board carton, and book of instructions..... $7.50

This Adding Machine has a capacity of 9,999,999 or $99,999.99 and it will give the correct result of any problem in addition, subtraction, multiplication or division which falls within this limit. It is constructed of brass and steel throughout. Polished gunmetal finish. There is nothing to get out of order or require adjustment and it will last a lifetime.

A written five-year guarantee is furnished with every Calculator. If the machine does not remain in perfect running order, or if it proves to be defective in material, quality or workmanship, it will be replaced, without charge, by a new machine any time within five years from the date of purchase.

Every Calculator is accompanied by a nickel-steel stylus for operating and a complete book of instructions and suggestions. It is securely packed in a heavy pebble-board carton that will stand "pocket wear" and hard usage almost indefinitely.

THE MARCHANT CALCULATOR



THE value and importance of a first-class and trustworthy calculating machine to the civil engineer, construction engineer, statistician and others who have considerable figure work to handle has long been conceded.

Such a machine is a great labor and time saver, while the relief it affords from wearying brain work is incalculable.

The Marchant Calculator (illustrated above) has met this long-felt want and has filled the requirements and demands of engineers and statisticians the world over.

Pencil and slide-rule methods of figuring problems are fast becoming obsolete. The up-to-date mining or construction company can no longer afford to have its employees spending time in unnecessary hand figuring when machine calculation has been perfected to such a degree as in the Marchant Calculator.

The Marchant is built on the rotary or drum principle. This principle can be appreciated by technical men as the best for direct action functioning.

By using the drum principle all unnecessary action is eliminated, thus insuring a minimum of expense in upkeep—springs, cams and other parts used in machines of the flat-bed principle being entirely done away with.

Operation

Unlike many of the machines on the market at the present time, the operation of the Marchant can be explained and taught to the novice in a very short time, it being unnecessary to engage a special operator to perform even the most intricate problems—the Marchant motto being "Do it yourself on a Marchant."

Proof

Every calculation performed on a Marchant is instantly proved, no hidden complements to memorize, each factor and result is at all times visible to the operator. It has been found that the proof feature saves 100 per cent of the time spent on rechecking, as is often the case when using the old method of logarithms. Time and absolute accuracy are big features and important ones when engineers are crowded with work.

THE MARCHANT CALCULATOR

Models

The latest model Marchant, namely the Pony, was built with the idea of producing a light, compact calculator of such convenient size that it could be taken to the job or moved about as a piece of hand baggage, and yet having all the well-known features of the standard model.

The Pony Model is built in two styles—with and without the top register dial. The top register dial gives a complete check on all figures operating on levers, a feature not to be overlooked by the engineer who is constantly using constant multipliers and divisors.

Application

The Marchant will handle, in a fraction of the time ordinarily spent, all kinds of engineering calculations. Traverses, averages, square root, cube root, assays, assessments, formulae and tonnages can all be handled with rapidity. A typical problem of the mining industry with which the average engineer comes in contact can be explained thus:

DISTRIBUTION OF METALS

6948.82 tons ore assays as follows:

0.129 oz. gold per ton.
5.72 oz. silver per ton.
3.225% copper.

Weights	Value
6948.82 × 0.129 = 896.398 oz. gold.	896.398 × 20.6718 = $18530.16.
6948.82 × 5.72 = 39747.25 oz. silver.	39747.25 × 689 = $27385.86.
3.225% of 2000 lb. = 64.5 lb. per ton.	448198.89 × 0.155 = $69470.83.
6948.82 × 64.5 lb. = 448198.89 lb. copper.	

SURVEYING CALCULATION

Bearing 34° 36′ E. distance 295.76.
Nat. cosine 0.82314; sine 0.56784.
0.82314 × 295.76 = 243.452 northing.
0.56784 × 295.76 = 167.944 easting.

This traverse can be figured easily on a Marchant in forty seconds.

Operation: Place distance or 295.76 on machine as constant and multiply by .82314. Leave figures on machine and interchange multiplier to .56784, getting second result. Point off seven decimal places (5+2).

A fine testimonial from one of our largest users has this to say:

"The machine proved itself so valuable in making up our cost statements and in verifying ore statements that we purchased five more Marchants. These are used by our engineers in all calculations pertaining to tonnages, averages, assays and percentages.

(Signed) "UTAH COPPER CO."

Some of the largest mining and engineering firms in this country and foreign lands are using the Marchant every day on their problems.

Among prominent users the Marchant numbers as its endorsers: Utah Iron and Steel Co., American Smelting and Refining Co., International Smelting Co., Ray Consolidated Copper, Chino Copper.

Our representative will deem it a pleasure to demonstrate the wide scope of flexibility of the Marchant. Descriptive literature and prices on request.

ALCO QUALITY DRAWING TOOLS

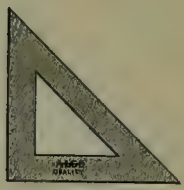
Every article in transparent celluloid and wood is made of the very best and finest material and guaranteed to be true and reliable.

CHERRY TRIANGLES

No. 3150

No. 3151

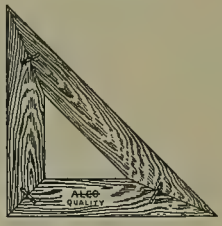
No. 3155


No. 3156

No. 3150	Cherry Triangles, solid, 30x60 degrees.				
	Size, inches—			7	9
	Each			$0.08	$0.10
No. 3151	Cherry Triangles, solid, 45 degrees.				
	Size, inches—			6	8
	Each			$0.08	$0.10
No. 3155	Cherry Triangles, framed, 30x60 degrees.				
	Size, inches—	7	9	11	14
	Each	$0.11	$0.15	$0.18	$0.24
No. 3156	Cherry Triangles, framed, 45 degrees.				
	Size, inches—	6	8	10	12
	Each	$0.12	$0.16	$0.20	$0.24

PEARWOOD TRIANGLES

No. 3160

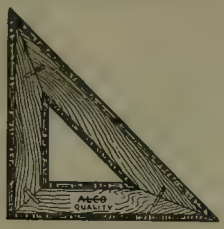

No. 3161

No. 3160	Pearwood Triangles, framed, 30x60 degrees.				
	Size, inches—	7	9	11	14
	Each	$0.18	$0.24	$0.30	$0.35
No. 3161	Pearwood Triangles, framed, 45 degrees.				
	Size, inches—	6	8	10	12
	Each	$0.18	$0.24	$0.30	$0.35

For prevailing prices see latest supplementary price list.

ASH, MAPLE-LINED TRIANGLES

No. 3165



No. 3166

No. 3165 Ash, maple-lined Triangles, mortised joints, 30x60 degrees.

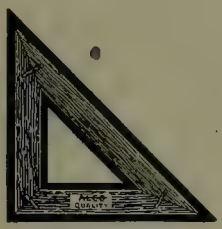
Size, inches—	6	8	10	12	14
Each	$0.22	$0.25	$0.30	$0.40	$0.50

No. 3166 Ash, maple-lined Triangles, mortised joints, 45 degrees.

Size, inches—	6	8	10	12	14
Each	$0.25	$0.30	$0.40	$0.50	$0.75

MAHOGANY, EBONY-LINED TRIANGLES

No. 3170



No. 3171

No. 3170 Mahogany, ebony-lined Triangles, 30x60 degrees.

Size, inches—	7	9	11	14	17
Each	$0.30	$0.40	$0.55	$0.75	$1.20

No. 3171 Mahogany, ebony-lined Triangles, 45 degrees.

Size, inches—	6	8	10	12	14
Each	$0.30	$0.40	$0.55	$0.75	$1.20

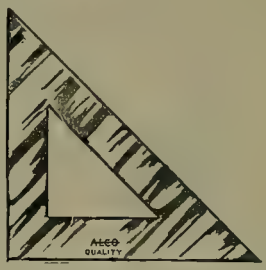
HARD RUBBER TRIANGLES

On account of the very small demand for the Hard Rubber Triangles, due to their non-transparency and tendency to collect dust, we have discontinued carrying this line in stock. We recommend our Transparent Triangles, which, we feel our customers will agree, are a far superior article at a slightly increased price.

For prevailing prices see latest supplementary price list.

STEEL TRIANGLES

No. 3175



No. 3176

No. 3175 Steel Triangles, nickel plated, open center, 30x60 degrees.

Size, inches	6	8	10	12	15
Each	$3.20	$3.85	$4.25	$5.50	$6.50

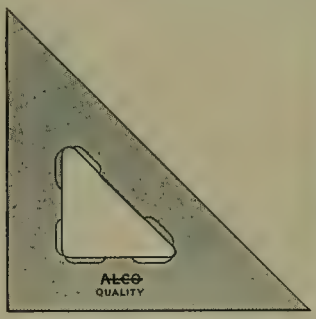
No. 3176 Steel Triangles, nickel plated, open center, 45 degrees.

Size, inches	6	8	10	12
Each	$3.50	$4.25	$5.50	$6.50

TRANSPARENT AMBER TRIANGLES

Best Quality. With finger lifts.

No. 3180



No. 3181

No. 3182

No. 3180 Transparent Amber Triangles, with finger lifts, 30x60 degrees.

Size, ins.	4	5	6	7	8	9	10	11	12	14	16	18
Each	.30	.35	.40	.45	.55	.60	.75	.85	.90	1.35	1.65	2.25

No. 3181 Transparent Amber Triangles, with finger lifts, 45 degrees.

Size, ins.	3	4	5	6	7	8	9	10	12	14	16	18
Each	.30	.35	.40	.50	.55	.75	.90	1.00	1.50	2.00	2.70	3.90

No. 3182 Transparent Amber Triangles, with finger lifts, 22½x67½ degrees.

Size, ins.	4	6	8	10	12	14	16
Each	.40	.50	.65	.85	1.00	1.35	1.70

Transparent Angles can be furnished in green if desired. Order by same number, but add letter G.

For dot and dash feature see pages 302 and 303.

TRANSPARENT AMBER TRIANGLES

Second Quality. Without finger lifts.

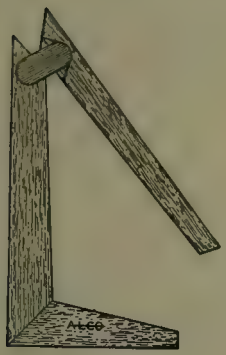
No. 3185 Transparent Amber Triangles, 30x60 degrees.

Sizs, inches	8	9	10	11	12
Each	$0.45	$0.50	$0.60	$0.75	$0.80

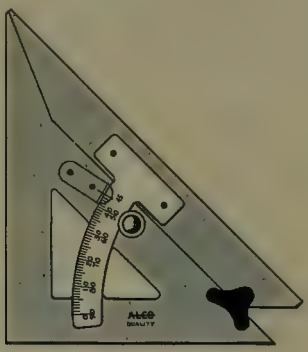
No. 3186 Transparent Amber Triangles, 45 degrees.

Sizes, each	6	7	8	9	10
Each	$0.45	$0.50	$0.60	$0.75	$0.80

ADJUSTABLE TRIANGLES



No. 3190



No. 3192

No. 3190 Adjustable Angle, mahogany, 7 in. $1.00

Adjustable Angle No. 3190 has a movable hypotenuse, which will by friction retain any angle to which it is set. It lies flush on either side and may be used for drawing equal angles in opposite directions. A handy tool for transferring or copying angles, drawing roof pitches, etc.

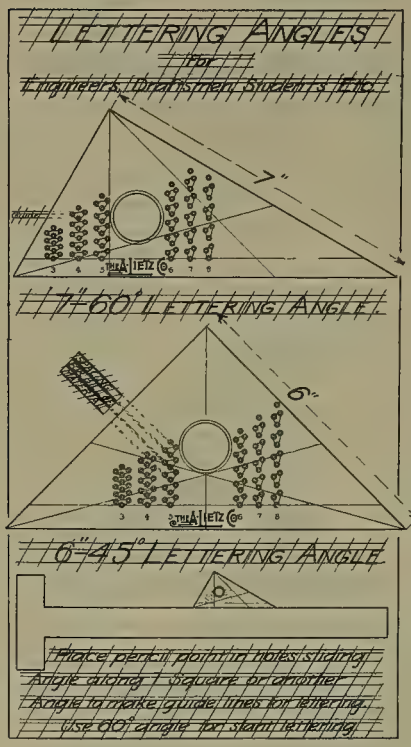
No. 3192 Adjustable Angle, transparent amber, with graduated arc.

Size, inches—	7	10	12	15
Each	$2.10	$3.90	$4.80	$6.90

Adjustable Angle No. 3192 is strongly made of extra heavy transparent amber celluloid. By means of a white celluloid arc divided to single degrees, any angle may be obtained and set with a metal clamp screw.

For prevailing prices see latest supplementary price list.

TRANSPARENT LETTERING ANGLES



The Lettering Angles are designed to give a quick and easy method of making accurately spaced guide lines for lettering drawings.

There are six columns of holes, the columns being subdivided into groups of three holes, the holes of each group being joined by scored lines. The figure under each column denotes the height of the standard capital letters in thirty-seconds of an inch. The standard spacings between groups, also for the lower case letters, are two-thirds the height of capitals. The purpose of three holes in each group is to enable the drawing of three guide lines for each line of lettering, when it is desired to use both lower case and capital letters.

The Lettering Angle is designed to slide on the hypotenuse when making standard spacings, but either of the other two sides may be used to get other spacings.

To use Lettering Angle, place the pencil point through a hole in the desired group, and slide along the T-square or another triangle; then place the pencil point through another hole and slide back. The Lettering Angle is moved along very easily by the pencil. The tapered holes prevent the breaking of the pencil point. The guide lines will be very accurately spaced, and drawn much more rapidly than by laying off with scale or dividers.

The lines scored across the Lettering Angle enable one to obtain angles of 15°, 30°, 45°, 60°, 75° and 90° from either a 45° or 60° triangle, by setting these scored lines on horizontal or perpendicular lines on the drawing board. The lines drawn at right angles and parallel to the hypotenuse are particularly valuable when sketching or doing work without the use of the T-square, because it facilitates very much the drawing of one line at right angles to another. These lines being scored on the under side of Lettering Angle, throw no shadow, whereas the edge of the Lettering Angle does.

The bevel pickup makes the Lettering Angle very easy to handle.

No. 3195 Transparent Amber Lettering Angles, 30x60 degrees.

Size, inches—	5	6	7	8	9
Each	$0.60	$0.70	$0.75	$0.85	$0.95

No. 3196 Transparent Amber Lettering Angles, 45 degrees.

Size, inches—	4	5	6	7	8
Each	$0.65	$0.75	$0.85	$0.95	$1.05

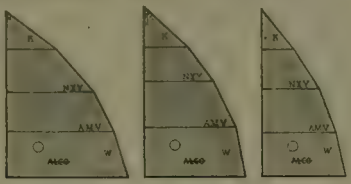
For dot and dash feature see pages 302 and 303.

For prevailing prices see latest supplementary price list.

LETTERING TEMPLETS

No. 3200 3½ inches high.

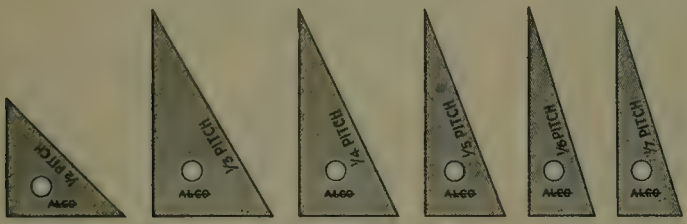
No. 3200 Transparent Amber Lettering Templets, 3 in set. Per set..... $1.80



No. 3201 3½ inches high.

No. 3201 Transparent Amber Lettering Templets, 3 in set. Per set..... $1.50

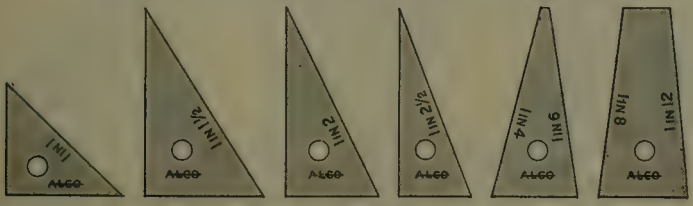
ROOF PITCHES



No. 3205

No. 3205 Transparent Amber Triangles for roof pitches, 6 in set. Per set..... $3.00
No. 3205 Transparent Amber Triangles for roof pitches, if sold separate, each..... .60

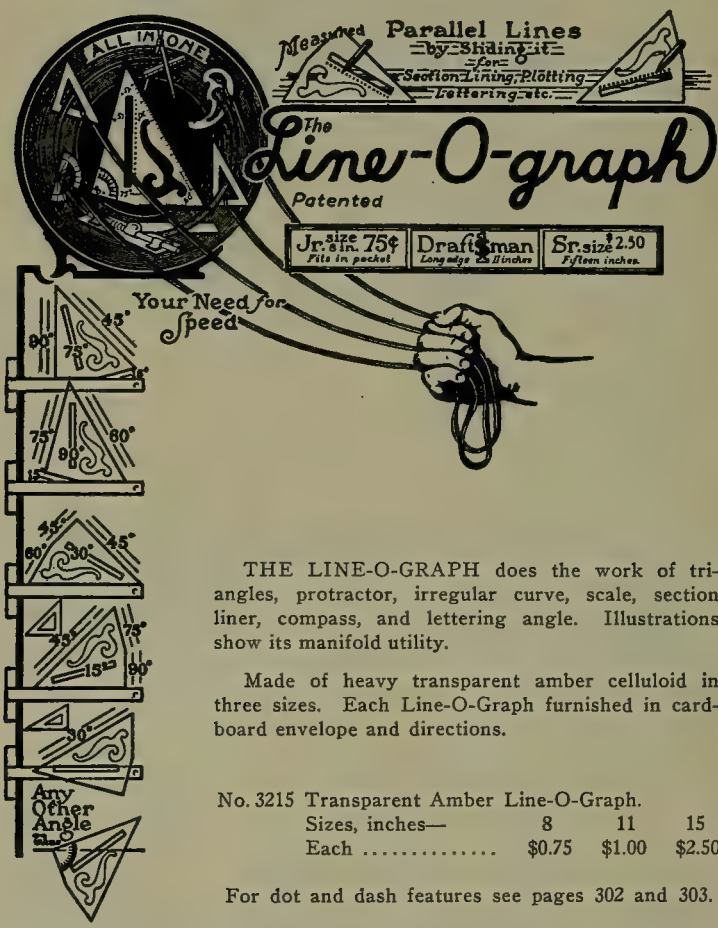
TRIANGLES FOR EMBANKMENTS



No. 3208

No. 3208 Transparent Amber Triangles for embankments, 8 slopes on 6 templets. Per set $4.50
No. 3208 Transparent Amber Triangles for embankments, if sold separate, single slope, each ..... .75
Double slope, each 1.00

A NEW COMBINATION TRIANGLE



THE LINE-O-GRAPH does the work of triangles, protractor, irregular curve, scale, section liner, compass, and lettering angle. Illustrations show its manifold utility.

Made of heavy transparent amber celluloid in three sizes. Each Line-O-Graph furnished in cardboard envelope and directions.

No. 3215 Transparent Amber Line-O-Graph.			
Sizes, inches—	8	11	15
Each	$0.75	$1.00	$2.50

For dot and dash features see pages 302 and 303.

The Line-O-Graph is also made of transparent green celluloid. If this color is desired, order by the above numbers and add the word GREEN.

For prevailing prices see latest supplementary price list.

CELLULOID IN SHEETS

Suitable for cutting your own curves and angles.

No. 3220 Transparent Amber Celluloid, extra heavy, as used for 16-inch 45-degree triangles.
Full sheet, 20x25 inches $4.00
Per running inch, 20 inches wide..... .20
Per square inch, less than 20 inches wide..... .01½

No. 3221 Transparent Amber Celluloid, heavy, as used for 12-inch 45-degree triangles.
Full sheet, 20x25 inches $3.00
Per running inch, 20 inches wide..... .15
Per square inch, less than 20 inches wide..... .01

No. 3222 Transparent Amber Celluloid, medium, as used for 8-inch 45-degree triangles.
Full sheet, 20x25 inches $2.50
Per running inch, 20 inches wide..... .12
Per square inch, less than 20 inches wide..... .01

Note: Any of the above thicknesses of Amber Celluloid can also be furnished in the green color. If this color is desired, order by the above numbers and add the word GREEN.

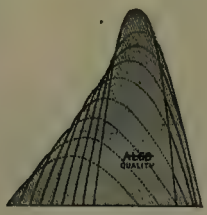
No. 3223 Transparent Celluloid, extra thin and flexible.
Full sheet, 20x25 inches $1.00
Per running inch, 20 inches wide..... .05
Per square inch, less than 20 inches wide..... .00½

No. 3224 Opaque White Photo Celluloid, polished one side only. Thin and flexible.
Full sheet, 20x25 inches $1.00
Per running inch, 20 inches wide..... .05
Per square inch, less than 20 inches wide..... .00½

HYPERBOLAS, ELLIPSES AND PARABOLAS

No. 3230

No. 3232



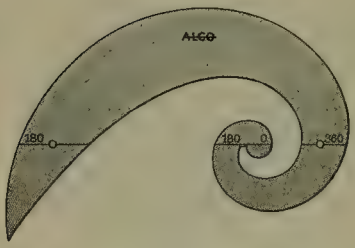
No. 3234

		Wood	Transparent Amber
No. 3230	Hyperbolas, 8 to set, 2 to 5½ inches	$1.50	$3.50
No. 3231	Ellipses, 6 to set, 2 to 4½ inches	1.25	2.50
No. 3232	Ellipses, 10 to set, 1½ to 6 inches	2.00	4.00
No. 3233	Parabolas, 8 to set, 1¼ to 5½ inches	1.50	3.50
No. 3234	Parabolas, 8 to set, 3¼ to 14¼ inches	3.00	8.00

For prevailing prices see latest supplementary price list.

IRREGULAR CURVES

SPECIAL CURVES



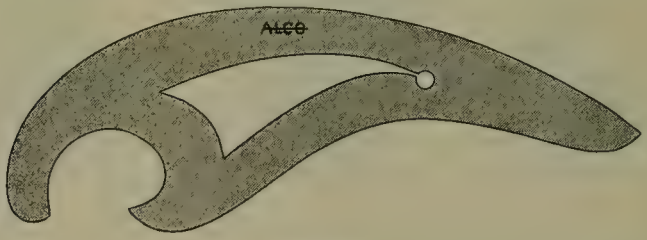
No. 3240

No. 3242

No. 3240 Logarithmic Spiral Curve, transparent amber. Each..... $1.75
No. 3242 Combination Curve, transparent amber. Each..... 1.00

No. 3244

No. 3244 Combination Curve, transparent amber. Each..... $1.75



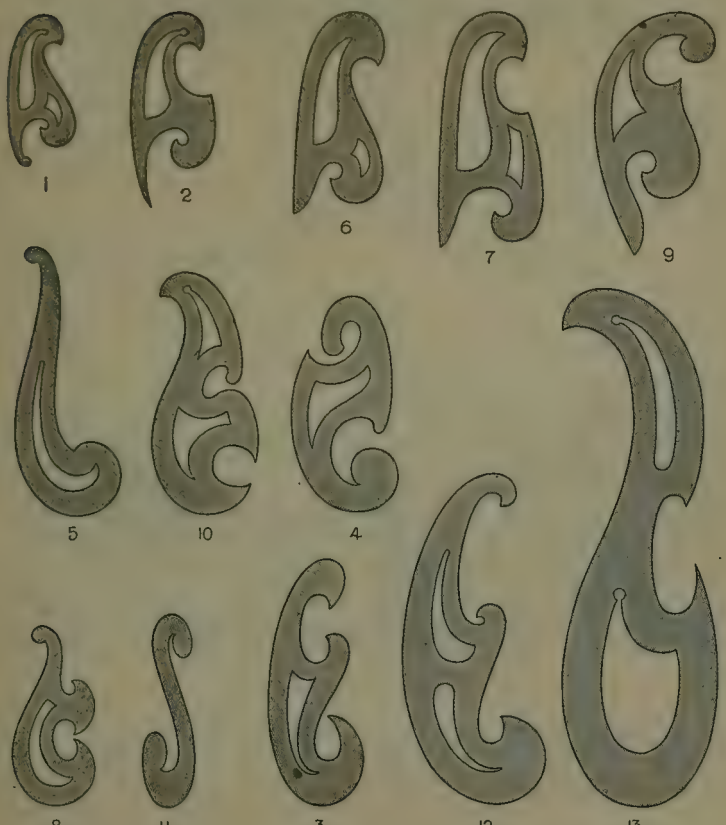
No. 3246

No. 3246 Aviation Curve, transparent amber. Each..... $1.00

For prevailing prices see latest supplementary price list.

IRREGULAR OR FRENCH CURVES

Made of transparent celluloid or wood.



	Pattern No.—	1	2	3	4	5	6	7	8	9	10	11	12	13
No. 3250	Pearwood	.20	.25	.30	.30	.30	.25	.30	.25	.30	.35	.20	.35	.45
No. 3251	Celluloid	.45	.55	.60	.60	.60	.55	.60	.45	.60	.60	.50	.90	1.50

The above curves can also be furnished in green transparent celluloid. If this color is desired, order by the above numbers and add the word GREEN.

We have omitted listing Hard Rubber Curves. In latter years the demand for these has given way almost entirely to the Transparent Curves, which are a far superior article at a slightly increased price.

For prevailing prices see latest supplementary price list.

SPLINES

Made of Transparent Amber Celluloid or Wood

No. 3255

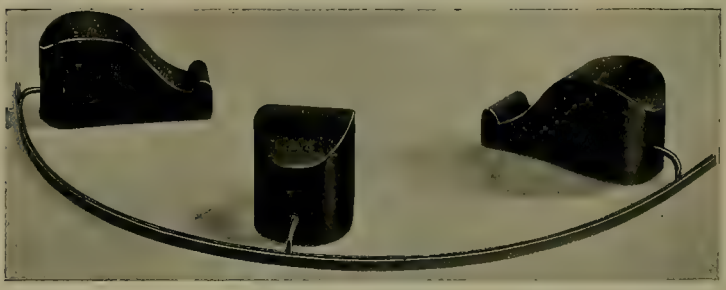
No. 3255 Pearwood Splines, grooved.

Length, inches—	18	24	30	36	42	48	60
Each	$0.15	$0.20	$0.25	$0.30	$0.35	$0.40	$0.50

No. 3256 Transparent Amber Celluloid Splines, grooved.

Length, inches—	18	24	30	36	42	48	60
Each	$0.35	$0.40	$0.45	$0.50	$0.55	$0.60	$0.75

WEIGHTS FOR SPLINES



Nos. 3260-3262

No. 3260 Improved Weights for Splines, with hook, 3½ lbs. Each.. $0.80
No. 3261 Improved Weights for Splines, with hook, 5 lbs. Each.. 1.00
No. 3262 Improved Weights for Splines, with hook, 8 lbs. Each.. 1.25

SET OF SPLINES AND SPLINE WEIGHTS

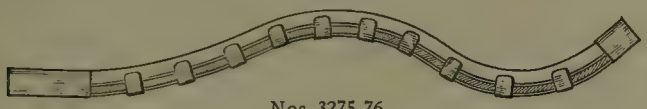
No. 3265 Set of Splines and Spline Weights, in strong wooden box containing: 1 each Pearwood Spline 18, 24, 30, 36, 42 and 48 inches; 1 each Transparent Amber Celluloid Spline 18, 24, 30, 36 and 42 inches; 4 Spline Weights No. 3260.
Per set $10.00

For prevailing prices see latest supplementary price list.

ADJUSTABLE CURVE RULERS

Nos. 3270-72

No. 3270 Adjustable Curve Ruler, double edge, 7 in. long. Each.. $0.45
No. 3271 Adjustable Curve Ruler, double edge, 15 in. long. Each.. 1.00
No. 3272 Adjustable Curve Ruler, double edge, 31 in. long. Each.. 1.85



Nos. 3275-76

No. 3275 Adjustable Curve Ruler, white rubber ruling edge, 12 in. long. Each $1.25
No. 3276 Adjustable Curve Ruler, white rubber ruling edge, 24 in. long. Each 1.90

No. 3278

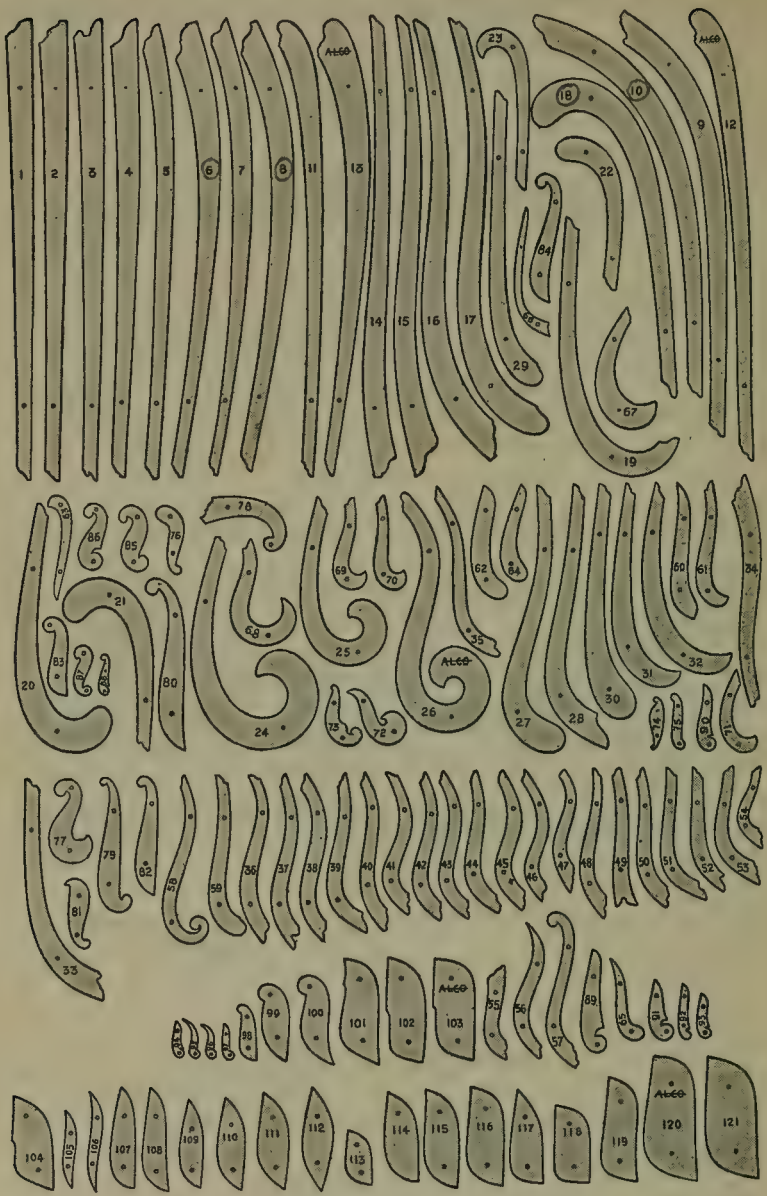
No. 3278 Adjustable Curve Ruler, black rubber ruling edge, 14½ in. long. Each $2.25
This is a similar tool to Nos. 3275-76, but of better quality.

No. 3279

No. 3279 Adjustable Curve Ruler, steel ruling edge, 30 in. long. Each $3.75

The above rules can be instantly adjusted and retained to any form or curve. The working edge on rules Nos. 3270-78 is made of rubber and rounded, so that by slightly inclining the pencil or pen several parallel curves may be drawn without moving the ruler. Ruler No. 3279 has a square steel ruling edge.

COPENHAGEN SHIP CURVES



Illustrations about one-ninth size.

No. 3290 Transparent Amber Copenhagen Ship Curves. No. 3291 Pearwood Copenhagen Ship Curves.

Page 456

For prices see opposite page.

COPENHAGEN SHIP CURVES

Pattern No.	No. 3290 Transparent Amber	No. 3291 Pearwood
1	$1.25	.....
2	1.25	$0.70
3	1.25	.....
4	1.25	.70
5	1.25	.....
6	1.25	.70
7	1.25	.....
8	1.25	.70
9	1.25	.....
10	1.25	.70
11	1.25	.....
12	1.25	.....
13	1.25	.70
14	1.25	.....
15	1.25	.70
16	1.25	.....
17	1.25	.70
18	1.00	.60
19	.75	.....
20	.75	.50
21	.75	.....
22	.65	.....
23	.65	.40
24	1.00	.....
25	.65	.40
26	1.25	.....
27	.75	.....
28	.75	.....
29	.75	.50
30	.65	.40
31	.75	.....
32	.75	.50
33	.75	.50
34	.75	.....
35	.75	.50
36	.50	.30
37	.50	.....
38	.50	.....
39	.50	.30
40	.50	.....
41	.50	.....
42	$0.50	.....
43	.50	.....
44	.50	$0.30
45	.50	.....
46	.50	.....
47	.50	.....
48	.50	.30
49	.50	.....
50	.50	.....
51	.50	.30
52	.50	.30
53	.50	.30
54	.50	.....
55	.50	.....
56	.50	.....
57	.65	.40
58	.75	.....
59	.75	.50
60	.65	.40
61	.65	.....
62	.50	.....
63	.50	.....
64	.45	.30
65	.50	.....
66	.50	.....
67	.50	.....
68	.65	.40
69	.50	.....
70	.50	.....
71	.50	.....
72	.40	.25
73	.45	.....
74	.40	.....
75	.45	.....
76	.50	.....
77	.50	.30
78	.50	.....
79	.65	.....
80	.75	.....
81	.50	.....
82	.65	.....
83	$0.50	$0.30
84	.45	.30
85	.50	.30
86	.50	.....
87	.45	.....
88	.30	.....
89	.45	.30
90	.45	.....
91	.40	.25
92	.40	.....
93	.30	.....
94	.30	.....
95	.30	.....
96	.30	.....
97	.30	.....
98	.40	.....
99	.50	.30
100	.50	.30
101	.50	.30
102	.50	.....
103	.50	.....
104	.50	.....
105	.50	.....
106	.45	.....
107	.40	.25
108	.50	.....
109	.50	.....
110	.50	.30
111	.50	.....
112	.50	.....
113	.45	.....
114	.50	.30
115	.50	.....
116	.50	.....
117	.50	.....
118	.50	.30
119	.50	.30
120	.50	.....
121	.50	.30

When ordering please state both catalogue and pattern number.

Numbers not listed in pearwood can be furnished in amber only.

No. 3290A Set of 45 transparent amber Ship Curves, containing one each curve of patterns as listed under No. 3291, above. In hardwood case. Per set $35.00

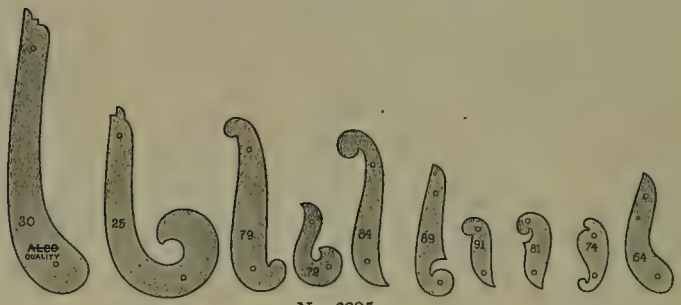
No. 3290B Set of 121 transparent amber Ship Curves, containing one each curve No. 1 to 121, as listed under No. 3290, above. In hardwood case. Per set 70.00

No. 3291A Set of 45 pearwood Ship Curves, containing one each curve of patterns as listed under No. 3291, above. In hardwood case. Per set 18.00

For prevailing prices see latest supplementary price list.

CURVES FOR MECHANICAL ENGINEERS

Made of Transparent Amber Celluloid or Pearwood.
In Sets.



No. 3295

No. 3295 Set of 10 Transparent Amber Curves, for Mechanical Engineers, containing one each curve of patterns numbers 25, 30, 64, 72, 74, 79, 84, 89, 91 and 98, as listed under No. 3290 on page 457.
In wooden box. Per set..... $4.80

No. 3296 Set of 10 Pearwood Curves, for Mechanical Engineers, containing one each curve of patterns numbers 25, 30, 64, 72, 74, 79, 84, 89, 91 and 98, as listed under No. 3291 on page 457.
In wooden box. Per set..... $3.20

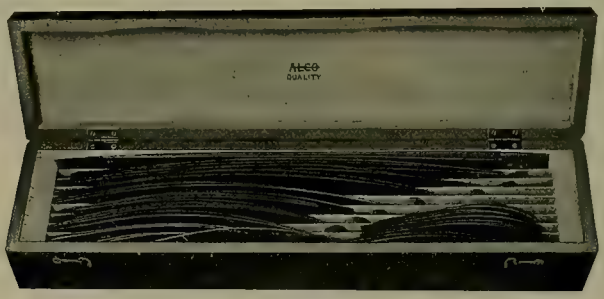
For prices of single curves see list on page 461.

For prevailing prices see latest supplementary price list.

RAILROAD CURVES

Made of Transparent Amber Celluloid, Pearwood, Metal, and Cardboard.
With and without tangent.

These curves are of the best workmanship and material. They are true and circular, and are the same on both edges, so that either edge may be used.



No. 3307

For description and price list see opposite page.

TRANSPARENT AMBER RAILROAD CURVES

With tangent

Sets are put up in polished mahogany boxes with partitions, which are plainly marked with the value of the curve contained. Thus the required curve is easily picked out, and the chances of bending or warping the curves are entirely eliminated.

No. 3300—Transparent Amber Railroad Curves, with tangent, set of 55 curves, viz.: 3, 3½, 4, 4½, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 30, 32, 34, 35, 36, 38, 40, 45, 50, 55, 60, 65, 70, 75, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200 inches radius, in wooden **box with partitions**....Per set $54.00

No. 3305—Transparent Amber Railroad Curves, with tangent, marked in degrees and inches, to scale 100 feet = 1 inch, set of 41 curves, viz.:

0°.30′=114.59 in.	3°.30′=16.37 in.	6°.00′=9.55 in.	8°.30′=6.75 in.
1°.00′= 57.30 in.	3°.45′=15.28 in.	6°.15′=9.17 in.	8°.45′=6.55 in.
1°.15′= 45.84 in.	4°.00′=14.33 in.	6°.30′=8.82 in.	9°.00′=6.37 in.
1°.30′= 38.20 in.	4°.15′=13.48 in.	6°.45′=8.49 in.	9°.15′=6.20 in.
1°.45′= 32.74 in.	4°.30′=12.73 in.	7°.00′=8.19 in.	9°.30′=6.04 in.
2°.00′= 28.65 in.	4°.45′=12.07 in.	7°.15′=7.91 in.	9°.45′=5.88 in.
2°.15′= 25.47 in.	5°.00′=11.46 in.	7°.30′=7.64 in.	10°.00′=5.74 in.
2°.30′= 22.92 in.	5°.15′=10.92 in.	7°.45′=7.40 in.	10°.30′=5.48 in.
2°.45′= 20.84 in.	5°.30′=10.42 in.	8°.00′=7.17 in.	11°.00′=5.22 in.
3°.00′= 19.10 in.	5°.45′= 9.97 in.	8°.15′=6.95 in.	11°.30′=4.99 in.
3°.15′= 17.63 in.			

In wooden box with partitions....Per set $40.00

No. 3307—Transparent Amber Railroad Curves, with tangent, marked in degrees and inches, to scale 100 feet = 1 inch, set of 55 curves, viz.:

0°.15′=229.18 in.	3°.45′=15.28 in.	7°.15′=7.91 in.	11°.30′=4.99 in.
0°.30′=114.59 in.	4°.00′=14.33 in.	7°.30′=7.64 in.	12°.00′=4.78 in.
0°.45′= 76.39 in.	4°.15′=13.48 in.	7°.45′=7.40 in.	12°.30′=4.59 in.
1°.00′= 57.30 in.	4°.30′=12.73 in.	8°.00′=7.17 in.	13°.00′=4.42 in
1°.15′= 45.84 in.	4°.45′=12.07 in.	8°.15′=6.95 in.	13°.30′=4.25 in.
1°.30′= 38.20 in.	5°.00′=11.46 in.	8°.30′=6.75 in.	14°.00′=4.10 in.
1°.45′= 32.74 in.	5°.15′=10.92 in.	8°.45′=6.55 in.	14°.30′=3.96 in
2°.00′= 28.65 in.	5°.30′=10.42 in.	9°.00′=6.37 in.	15°.00′=3.83 in.
2°.15′= 25.47 in.	5°.45′= 9.97 in.	9°.15′=6.20 in.	16°.00′=3.59 in.
2°.30′= 22.92 in.	6°.00′= 9.55 in.	9°.30′=6.04 in.	17°.00′=3.38 in.
2°.45′= 20.84 in.	6°.15′= 9.17 in.	9°.45′=5.88 in.	18°.00′=3.20 in.
3°.00′= 19.10 in.	6°.30′= 8.82 in.	10°.00′=5.74 in.	19°.00′=3.03 in.
3°.15′= 17.63 in.	6°.45′= 8.49 in.	10°.30′=5.48 in	20°.00′=2.88 in.
3°.30′= 16.37 in.	7°.00′= 8.19 in.	11°.00′=5.22 in.	

In wooden box, with partitions....Per set $54.00

No. 3307A—Separate Transparent Amber Railroad Curves, with tangent.....Each $1.20

Railroad Curves of any desired scale cut to order.

For prevailing prices see latest supplementary price list.

TRANSPARENT AMBER RAILROAD CURVES

Without tangent

No. 3310 Transparent Amber Railroad Curves, without tangent, set of 10 curves, viz.: 12, 24, 36, 48, 60, 72, 84, 96, 108, 120 inches radius, in wooden box. Per set..... $9.00

No. 3311 Transparent Amber Railroad Curves, without tangent, set of 17 curves, viz.: 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60 inches radius, in wooden box. Per set..... 15.00

No. 3312 Transparent Amber Railroad Curves, without tangent, set of 24 curves, viz.: 2, 2½, 3, 3½, 4, 4½, 5, 5½, 6, 6½, 7, 7½, 8, 8½, 9, 9½, 10, 12, 14, 16, 18, 20, 22, 24 inches radius, in wooden box. Set... 22.50

No. 3313 Transparent Amber Railroad Curves, without tangent, set of 43 curves, viz.: 3½, 4, 4½, 5, 5½, 6, 6½, 7, 7½, 8, 8½, 9, 9½, 10, 12, 14, 16, 18, 20, 22, 24, 27, 30, 33, 36, 39, 42, 48, 54, 60, 66, 72, 78, 84, 90, 100, 110, 120, 130, 140, 160, 180, 200 inches radius, in wooden box. Per set..... 37.50

No. 3313A Separate Transparent Amber Railroad Curves, without tangent. Each..... 1.00

PEARWOOD RAILROAD CURVES

No. 3320 Pearwood Railroad Curves, without tangent, 10 in set, viz.: 12, 24, 36, 48, 60, 72, 84, 96, 108, 120 inches radius, in wooden box. Set.. $4.00

No. 3321 Pearwood Railroad Curves, without tangent, 17 in set, viz.: 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60 inches radius, in wooden box. Per set..... 6.50

No. 3323 Pearwood Railroad Curves, without tangent, 43 in set, viz.: 3½, 4, 4½, 5, 5½, 6, 6½, 7, 7½, 8, 8½, 9, 9½, 10, 12, 14, 16, 18, 20, 22, 24, 27, 30, 33, 36, 39, 42, 48, 54, 60, 66, 72, 78, 84, 90, 100, 110, 120, 130, 140, 160, 180, 200 inches radius, in wooden box. Per set..... 15.00

No. 3323A Separate Pearwood Railroad Curves, without tangent. Each..... .50

No. 3323B Separate Pearwood Railroad Curves, with tangent. Each..... .75

METAL RAILROAD CURVES

Without tangent

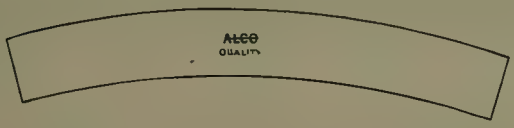
No. 3325 Metal Railroad Curves, 10 in set, 12 to 120 inches radius, viz.: 12, 24, 36, 48, 60, 72, 84, 96, 108, 120 inches, in wooden box. $6.20

No. 3326 Metal Railroad Curves, 17 in set, 12 to 60 inches radius, viz.: 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60 inches, in wooden box. 10.80

No. 3326A Separate Metal Railroad Curves, without tangent. Each. 80

CARDBOARD RAILROAD CURVES

Without tangent



No. 3330 Cardboard Railroad Curves, 30 in set, viz.: 1½, 2, 2½, 3, 3½, 4, 4½, 5, 5½, 6, 7, 8, 9, 10, 11, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 35, 40, 45, 50, 60 inches radius, in wooden box. Per set. $6.00

No. 3331 Cardboard Railroad Curves, 50 in set, viz.: 1½, 2, 2½, 3, 3½, 4, 4½, 5, 5½, 6, 6½, 7, 7½, 8, 8½, 9, 9½, 10, 10½, 11, 11½, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100, 110, 120 inches radius, in wooden box. Per set. . . 9.75

No. 3332 Cardboard Railroad Curves, 100 in set, viz.: 1½, 2, 2½, 3, 3½, 4, 4½, 5, 5½, 6, 6½, 7, 7½, 8, 8½, 9, 9½, 10, 10½, 11, 11½, 12, 12½, 13, 13½, 14, 14½, 15, 15½, 16, 16½, 17, 17½, 18, 18½, 19, 19½, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 70, 75, 80, 85, 90, 95, 100, 110, 120, 130, 140, 150, 160, 180, 200, 220, 240 inches radius, in wooden box. Per set. . . . 18.00

Celluloid in Sheets for cutting Special Curves listed on page 455.

For prevailing prices see latest supplementary price list.

STRAIGHTEDGES

No. 3350

No. 3350—**CHERRY STRAIGHTEDGES,** one edge beveled.

Sizes, inches	15	18	24	30	36	42
Each	$0.15	$0.20	$0.25	$0.30	$0.40	$0.50

No. 3352

No. 3352—**HARDWOOD-LINED STRAIGHTEDGES,** square edges.

Sizes, inches	24	30	36	42	48	54	60	72	84	96	120
Each	$0.35	$0.45	$0.60	$0.75	$1.00	$1.20	$1.50	$2.00	$2.75	$3.75	$5.00

No. 3354

No. 3354—**MAHOGANY EBONY-LINED STRAIGHTEDGES,** square edges.

Sizes, inches	24	30	36	42	48	54	60	72
Each	$0.50	$0.60	$0.80	$1.00	$1.35	$1.60	$2.00	$2.75

No. 3356

No. 3356—**MAPLE TRANSPARENT AMBER-LINED STRAIGHTEDGES.**

Sizes, inches	15	18	24	30	36	42	48	54	60	72
Each	$0.70	$0.75	$1.00	$1.25	$1.50	$1.80	$2.20	$3.00	$4.00	$6.00

No. 3358

No. 3358—**STEEL STRAIGHTEDGES,** nickel plated, **one edge beveled.**

Sizes, inches	15	18	24	30	36	42	48	60	72
Width, inches	1⅛	1¼	1½	1¾	2	2¼	2½	2¾	3
Each	$1.75	$2.00	$3.00	$4.00	$5.00	$6.50	$8.00	$11.00	$15.00

No. 3360

No. 3360—**STEEL STRAIGHTEDGES,** nickel plated, **square edges.**

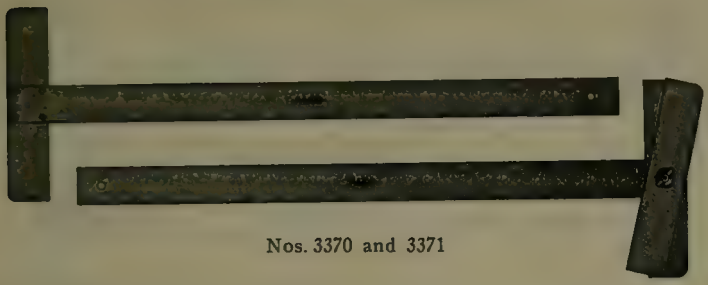
Sizes, inches	15	18	24	30	36	42	48	60	72
Width, inches	1⅛	1¼	1½	1¾	2	2¼	2½	2¾	3
Each	$1.25	$1.50	$2.00	$3.00	$4.00	$5.00	$6.00	$8.50	$12.00

See Parallel Straightedge Attachment, page 466.

For dot and dash feature see pages 302 and 303.

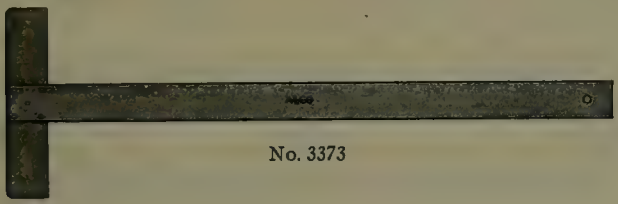
For prevailing prices see latest supplementary price list.

WOODEN T-SQUARES



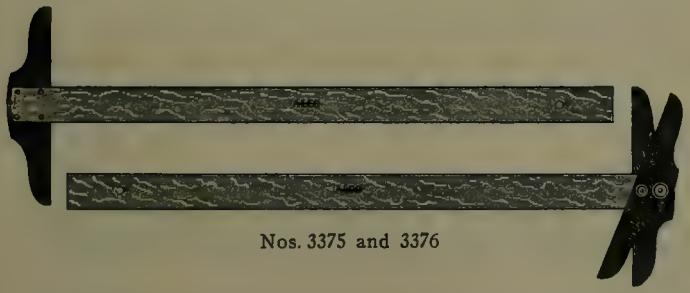
Nos. 3370 and 3371

No. 3370 Cherry, plain blade, fixed head. Size, inches—	15	18	21	24	30
Each	$0.15	$0.20	$0.25	$0.25	$0.30
No. 3371 Cherry, plain blade, shifting head. Size, inches—	15	18	21	24	30
Each	$0.50	$0.60	$0.65	$0.70	$0.80



No. 3373

No. 3373 Pearwood, extra quality, fixed head. Size, inches—	15	18	24	30	36	42	48
Each	$0.25	$0.30	$0.35	$0.45	$0.55	$0.65	$0.90



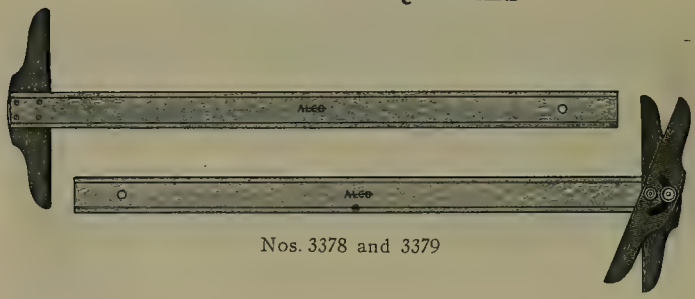
Nos. 3375 and 3376

No. 3375 Maple Blade, walnut fixed head. Size, inches—	15	18	24	30	36	42	48
Each	$0.35	$0.45	$0.60	$0.75	$0.90	$1.05	$1.20
No. 3376 Maple Blade, walnut shifting head, with two fine brass milled swivels. Size, inches—	15	18	24	30	36	42	48
Each	$0.85	$1.00	$1.20	$1.35	$1.50	$1.65	$1.85

Note: The 15- and 18-inch T-Squares have only one brass swivel.

For prevailing prices see latest supplementary price list.

WOODEN T-SQUARES



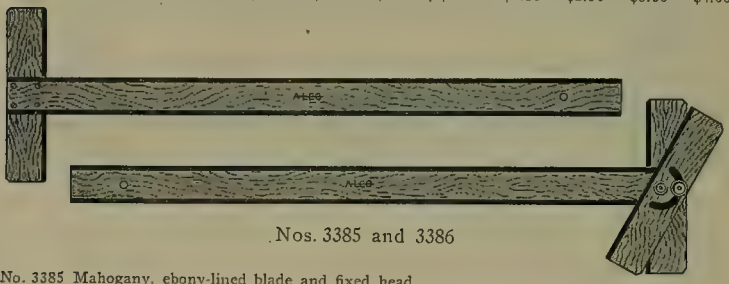
Nos. 3378 and 3379

No. 3378 Hardwood-lined Blade, walnut fixed head.

Size, inches—	24	30	36	42	48	54	60	72
Each	$0.75	$0.90	$1.05	$1.25	$1.50	$1.75	$2.25	$3.00

No. 3379 Hardwood-lined blade, walnut shifting head, with two fine brass milled swivels.

Size, inches—	24	30	36	42	48	54	60	72
Each	$1.35	$1.50	$1.65	$1.85	$2.15	$2.50	$3.00	$4.00



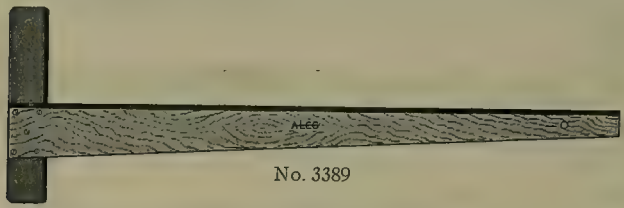
Nos. 3385 and 3386

No. 3385 Mahogany, ebony-lined blade and fixed head.

Size, inches—	24	30	36	42	48	54	60	72
Each	$1.00	$1.20	$1.40	$1.50	$1.85	$2.25	$2.60	$3.00

No. 3386 Mahogany, ebony-lined blade and shifting head, with two fine brass milled swivels.

Size, inches—	24	30	36	42	48	54	60
Each	$1.75	$2.00	$2.25	$2.50	$2.80	$3.25	$4.00



No. 3389

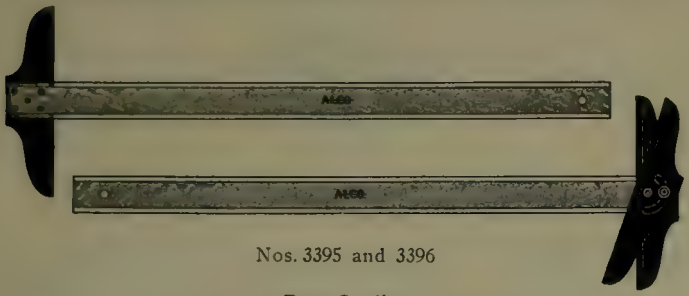
No. 3389 Mahogany, ebony-lined blade and fixed head, tapered.

Size, inches—	36	42	48	54	60	72
Each	$1.40	$1.60	$1.85	$2.25	$2.50	$3.00

T-Square No. 3389 has a tapered blade, very wide at the base. This construction will prevent spring at the further end of the blade. The drawing edge is in line with the center of the head.

For prevailing prices see latest supplementary price list.

TRANSPARENT AMBER-LINED T-SQUARES



Nos. 3395 and 3396

Best Quality

No. 3395 Transparent amber-lined maple blade, ebony fixed head.

Size, inches—	15	18	24	30	36	42	48	54	60	72
Each	1.00	1.10	1.50	1.85	2.15	2.50	3.00	4.00	5.00	6.00

No. 3396 Transparent amber-lined maple blade, ebony shifting head, with two fine brass milled swivels.

Size, inches—	15	18	24	30	36	42	48	54	60	72
Each	1.60	1.90	2.45	2.80	3.20	3.60	4.20	5.25	6.25	7.50

Note: The 15- and 18-inch T-Squares have only one brass swivel.

Second Quality

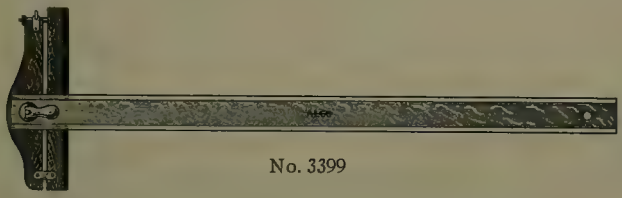
No. 3397 Transparent amber-lined maple blade, fixed head.

Size, inches—	18	24	30	36
Each	$0.90	$1.25	$1.50	$1.75

No. 3398 Transparent amber-lined maple blade, shifting head.

Size, inches—	18	24	30	36
Each	$1.65	$2.10	$2.40	$2.70

These T-Squares are of a cheaper construction than our Nos. 3395-96 and are made to meet the demands of the student, etc.



No. 3399

No. 3399 Transparent amber-lined maple blade, movable head with patent nickel-plated clamping swivel, and micrometer adjustment. Best quality.

Size, inches—	24	30	36	42	48
Each	$3.15	$3.50	$3.90	$4.35	$5.00

For dot and dash feature see pages 302 and 303.

For prevailing prices see latest supplementary price list.

T-SQUARE WITH PROTRACTOR

No. 3405

No. 3405 T-Square with Protractor, mahogany, ebony-lined blade and head, with patent nickel-plated clamping swivel, and micrometer adjustment.

Size, inches—	30	36	42
Each	$5.00	$6.00	$7.00

PARALLEL STRAIGHTEDGE OR AUTOMATIC T-SQUARE

Nos. 3407-8

The Parallel Straightedge consists of a set of two double pulleys attached to the back corners of the drawing board, and two single pulleys attached to the front corners. A steel piano wire is placed around these pulleys, making a double lap along each end and back of the board but no wire across the front. By crossing the wire at the back, the upper laps at both ends must move forward and back simultaneously.

The ends of the wire are joined together at the back through a steel spring. Both ends of the straightedge are attached to the upper wires at the ends of the board by binding posts, thus making it possible to move one end of the straightedge without moving the other a corresponding amount in the same direction.

All pulleys, brackets and binding posts are made of brass, accurately machined, highly polished, and lacquer finished.

No. 3407 Mahogany, ebony-lined Parallel Straightedge.

Length of board, inches—	24	30	36	42	48	55	60	72	84
Price, complete outfit	$5.40	$5.75	$5.85	$6.10	$6.20	$6.35	$6.50	$7.75	$9.50

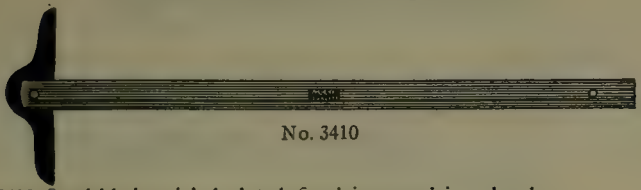
No. 3408 Maple, transparent amber-lined Parallel Straightedge.

Length of board, inches—	24	30	36	42	48	55	60	72	84
Price, complete outfit	$5.90	$6.15	$6.40	$6.70	$7.00	$7.85	$8.75	$10.00	$11.75

When ordering, please state length and width of drawing board.

For prevailing prices see latest supplementary price list.

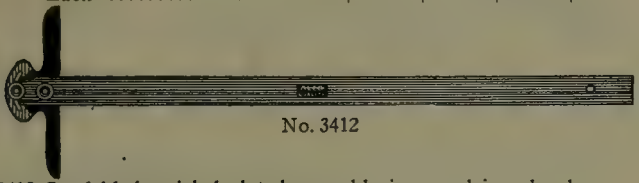
STEEL BLADE T-SQUARES



No. 3410

No. 3410 Steel blade, nickel plated, fixed japanned iron head.

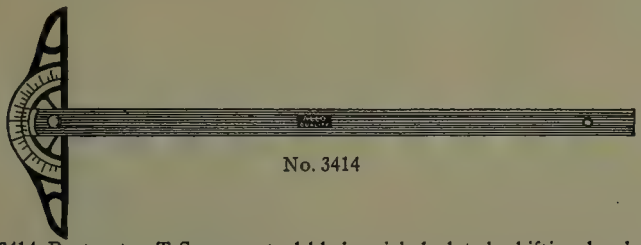
Size, inches—	24	30	36	42	48
Each	$3.50	$4.50	$5.50	$6.50	$8.50



No. 3412

No. 3412 Steel blade, nickel plated, movable japanned iron head.

Size, inches—	24	30	36	42	48
Each	$5.00	$5.70	$6.70	$7.70	$9.95

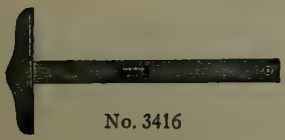


No. 3414

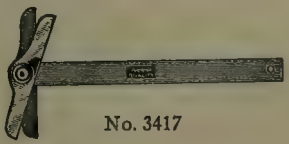
No. 3414 Protractor T-Square, steel blade, nickel plated, shifting head, with protractor divided to half degrees, vernier on end of blade reading to minutes.

Size, inches—	24	30	46	42
Each	$8.50	$9.50	$10.50	$11.50

ENGRAVERS' T-SQUARES



No. 3416



No. 3417

No. 3416 Steel blade, fixed brass head.

Size, inches—	4	6	8	10	12
Each	$1.00	$1.25	$1.50	$2.00	$2.50

No. 3417 Steel blade, shifting brass head, with swivel.

Size, inches—	4	6	8	10	12
Each	$1.25	$1.50	$1.75	$2.25	$2.75

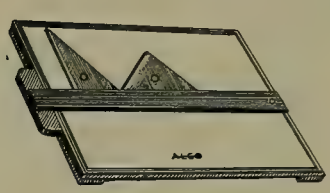
PERSPECTIVE LINEADS

No. 3430
Nickel-plated mountings.

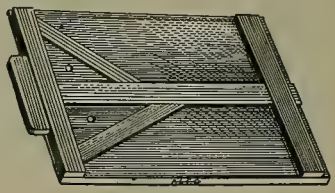
		Each
No. 3430	Maple Blades, 24 inches, arms 10 inches long	$3.00
No. 3431	Maple Blades, 30 inches, arms 11 inches long	3.50
No. 3432	Maple Blades, 36 inches, arms 12 inches long	4.00

Perspective Lineads are used when the vanishing point of a perspective drawing is beyond the drawing board. One of the blades may be shifted to either end of the cross head, for use from the right and left-hand side. Instructions with each Perspective Linead.

SUITCASE DRAWING KITS OR SKETCH BOARDS



Top



Bottom

The Suitcase Drawing Kit or Sketch Board consists of a drawing board, a T-square, and two wooden triangles, one 45 degrees and one 30x60 degrees. The board is lightly constructed and may easily be carried in a suitcase. It is reinforced on the under side with cleats, one at each end, to prevent it from warping. When not in use the triangles and T-square are held firmly in place, by means of a small metal spring, under one of the end cleats. An excellent drawing board for outside sketching, and for students.

		Each
No. 3435	Suitcase Drawing Kit 10x12	$0.45
No. 3436	Suitcase Drawing Kit 13x19	.70
No. 3437	Suitcase Drawing Kit 17x22	1.10

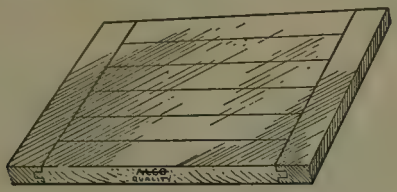
For prevailing prices see latest supplementary price list.

DRAWING BOARDS

Our Drawing Boards are of the best workmanship and material. They are made of narrow strips of lumber, specially selected and thoroughly seasoned.

BASSWOOD DRAWING BOARDS

We recommend these boards for all schools and colleges. The wood is entirely without grain, the thumbtacks are easily removed, and the points will not leave pin holes.



No. 3440

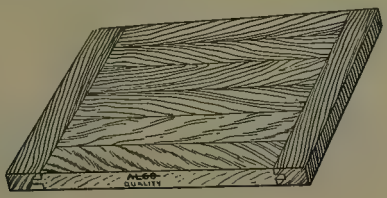
With dovetailed end cleats, surfaced both sides.

No. 3440 Basswood Drawing Board.

	Each		Each
12x17	$0.65	22x28	$1.25
16x21	.75	23x31	1.50
18x24	.95	27x34	2.00
19x25	1.00	31x42	2.50
20x26	1.10		

PINEWOOD DRAWING BOARDS

Made in our own factory, of narrow strips of thoroughly seasoned pinewood, especially selected. Finished with a light coat of shellac. Dovetailed and cleats.



No. 3445

No. 3445 Pinewood Drawing Board, surfaced both sides.

	Each		Each
12x17	$0.70	23x31	$1.80
16x21	1.00	27x34	3.00
20x26	1.30	31x42	4.00

For extra quality Lacquered Pinewood Boards, for Plane Table Outfits, see page 119.

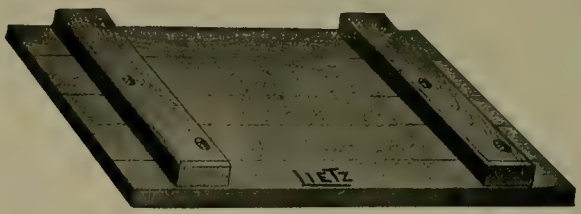
For prevailing prices see latest supplementary price list.

PINEWOOD DRAWING BOARDS

Extra Fine Quality. With Hardwood Ledges.

The hardwood ledges are attached to the board by means of screws, which pass through oblong slots, with metal oblong washers, to allow for contraction and expansion.

Made in our own factory, of narrow strips of thoroughly seasoned Pinewood, especially selected. Finished with a light coat of shellac.



No. 3450

No. 3450 Pinewood Drawing Board.

	Each		Each
18x24	$1.90	42x72	$18.00
19x25	2.15	42x84	21.00
20x26	2.50	42x96	26.00
22x28	2.80	48x72	24.00
23x31	3.25	48x84	27.00
27x34	3.75	48x96	33.00
30x36	4.75	48x108	38.00
31x42	5.00	48x120	44.00
33x55	8.40	54x96	41.00
36x48	8.00	54x108	46.00
36x60	10.00	54x120	50.00
36x72	16.00	60x96	47.00
36x84	18.00	60x108	50.00
42x60	15.00	60x120	58.00

Note: All the larger boards have three hardwood ledges. We can make any other size board to order. Delivery about two weeks. The above prices include crating for shipment.

For Trestles and Horses for drawing boards see pages 472-474.

For prevailing prices see latest supplementary price list.

DETAIL DRAWING BOARDS

These boards are of the highest quality. Made in our own factory, of narrow strips of thoroughly seasoned Pinewood, especially selected. The hardwood ledges are attached to the board by means of screws, which pass through oblong slots, with metal oblong washers, to allow for contraction and expansion. Ends inlaid with hardwood strips to assure a smooth working edge. The under side of these boards is grooved and the ends are cut to further allow for contraction or expansion. Finished with light coat of shellac.

No. 3452

No. 3452 Pinewood Detail Drawing Board.

	Each		Each
16x21	$2.50	31x42	$6.50
20x26	3.20	33x55	10.00
23x31	4.00	36x60	12.00

Other sizes to order. Delivery about two weeks.

DUSTING BRUSHES

For removing crumbs of rubber, etc., from drawings.

Nos. 3458-3459

No. 3460

	Each
No. 3458 Dusting Brush, invisible wire drawn, 8-in. brush with 6-in handle	$0.65
No. 3459 Dusting Brush, similar to No. 3458, but all bristle, set in pitch; 8-in. brush with 6-in. handle	.80
No. 3460 Crumb Brush, white bristle, 8-in. brush with 6-in. handle	.85

For prevailing prices see latest supplementary price list.

HORSES AND TRESTLES FOR DRAWING BOARDS

No. 3479

All horses are 37 inches high.

No. 3475 Plain Wooden Horses, pinewood, straight top only, 30 inches wide. Per pair $1.80

No. 3476 Plain Wooden Horses, pinewood, straight top only, 38 inches wide. Per pair 2.00

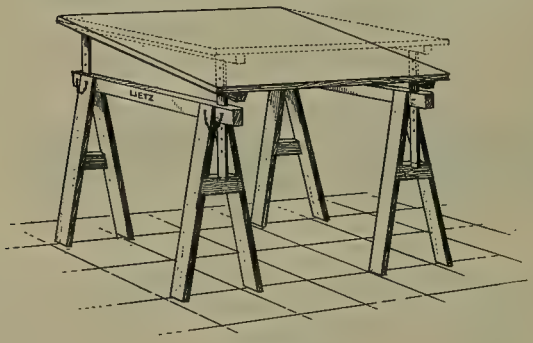
No. 3477 Wooden Horses, fine quality, straight top only, 30 inches wide. Per pair 3.25

No. 3478 Wooden Horses, fine quality, straight top only, 38 inches wide. Per pair 3.50

No. 3479 Wooden Horses, fine quality, with removable slanting top, 30 inches wide. Per pair 5.00

No. 3480 Wooden Horses, fine quality, with removable slanting top, 38 inches wide. Per pair 5.50

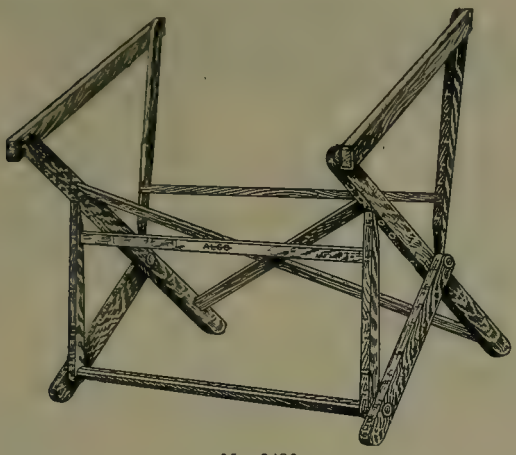
ADJUSTABLE WOODEN HORSES



No. 3484

No. 3484 Adjustable Wooden Horses, fine quality, with top 35 inches wide, adjustable for height from 37 to 47 inches on slope or level. Per pair $7.50

TRESTLES FOR DRAWING BOARDS



No. 3490

Folding Hardwood Trestles Only, Without Boards

For Boards to fit, see Nos. 3440, 3445, 3450 and 3452.

No. 3490A Folding Hardwood Trestle to accommodate boards of the following sizes: 23x31, 27x34, or 30x36. Trestle only.....	$6.50
No. 3490B Folding Hardwood Trestle to accommodate board 31x42. Trestle only	7.50
No. 3490C Folding Hardwood Trestle to accommodate boards of the following sizes: 33x55 or 36x48. Trestle only.....	8.50
No. 3490D Folding Hardwood Trestle to accommodate boards of the following sizes: 36x60, 36x72, 42x60 or 42x72. Trestle only	10.00
No. 3490E Folding Hardwood Trestle to accommodate boards of the following sizes: 48x72, 48x84, 48x96 or 54x96. Trestle only	12.00

The Folding Hardwood Trestles are of a firm construction and the range of adjustment is from 31 to 41 inches in height and from level to 45° slant of board. When folded these trestles occupy very little space.

For prevailing prices see latest supplementary price list.

TRESTLES FOR DRAWING BOARDS

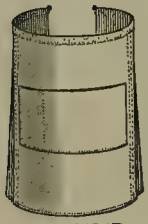
No. 3492

Adjustable Hardwood Trestles only for Large Drawing Boards
For Boards to fit see No. 3450.

	Each
No. 3492 Adjustable hardwood Trestle only, beechwood.....	$10.00
No. 3493 Adjustable hardwood Trestle only, golden oak	15.00

These trestles are designed to be used for different length tops. They can be adjusted to any height or desired slant, and the standards can be set to accommodate any size board from 42 to 100 inches or more in length. The extreme length of the cross rails is 72 inches, and the top rails are 36 inches wide.

DRAFTSMEN'S APRONS AND SMOCKS



No. 3494B

	Each
No. 3494A Short Apron, 16 inches long.....	$0.35
No. 3494B Long Apron, 22 inches long.....	.50

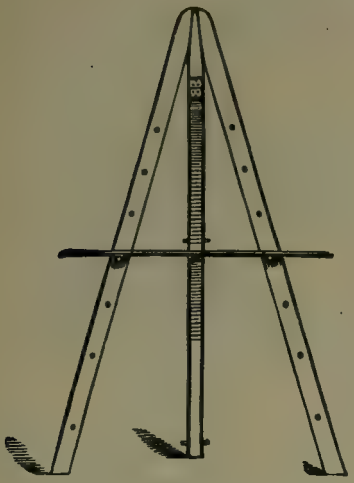
These Aprons are made of strong cotton material in slate color, with a steel wire spring, a device that can be quickly adjusted to the waist, and replaces the string clasps, without slipping from the position in which it is placed.

	Each
No. 3495 Draftsmen's Smocks	$2.00

Draftsmen's Smocks are a protection to the garment over which they loosely but neatly fit. Made of strong cotton material, tan or light blue in color, in one size only, accommodating both male and female. Buttoned in front, easily slipped on and off.

For prevailing prices see latest supplementary price list.

EASELS



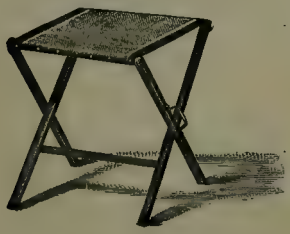
No. 3496

No. 3497

No. 3498

		Each
No. 3496	Hardwood Easel, 72 inches high, with 2 pins and movable tray 3x27 inches	$0.75
No. 3947	Hardwood Folding Easel, 72 inches high, with 2 pins and movable tray 3x27 inches	1.50
No. 3498	Rack Easel, 72 inches high, with sliding tray.	
	(A) Pinewood	5.00
	(B) Oiled walnut	7.50

SKETCHING STOOLS



No. 3500

		Each
No. 3500	Sketching Stool, ashwood, square folding, strong canvas seat, with brass handle	$0.75

For prevailing prices see latest supplementary price list.

THE HOFFMAN ARTIST'S DRAWING STAND AND DRAWING BOARD BRACKET

No. 3505

No. 3507

The Hoffman Artist's Drawing Stand No. 3505 and Drawing Board Bracket No. 3507 are strongly constructed of steel tubing and iron castings, fitted up in the best possible manner and handsomely finished in nickel and black enamel, making a very attractive and most useful article.

By means of the Drawing Board Bracket No. 3507 a drawing board may be attached to anything that has a clamping edge, while the Artist's Stand No. 3505 has a tripod, which makes it complete in itself. Either the bracket or the stand may be purchased and later one converted into the other by adding the tripod or the clamp to the equipment.

With either arrangement the drawing board can be adjusted instantly to any desired height, tilted and locked at any angle, from horizontal to vertical, and revolved. The outfits are light and easily transferred from office to home or the field. After removing three nuts from the brace which connects the tripod it will fold and pack in the box, 4½x5x24 inches.

	Each
No. 3505 Hoffman Artist's Drawing Stand Complete, with drawing board 23x31 and oak tray 14x10 with attachments.....	$12.50
No. 3506 Hoffman Artist's Drawing Stand, same as No. 3505 but without oak tray and attachments	10.50
No. 3507 Hoffman Drawing Board Bracket Complete, with drawing board 23x31	6.50

NOTE—If either stand or bracket is wanted without the drawing board deduct $1.50. Other sizes of boards may be attached, see Nos. 3440 and 3445.

No. 3505A Tripod only, for converting bracket into stand.....	4.00
No. 3507A Clamp only, for converting stand into bracket.....	.85

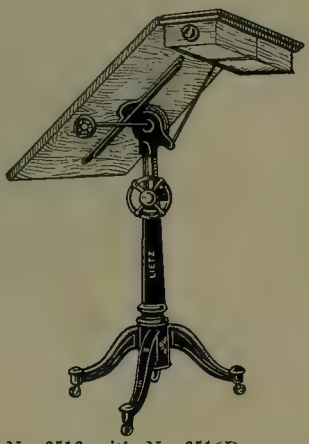
When you order Artist's Stand No. 3505 or 3506 together with Clamp No. 3507A you will have both the Stand and the Bracket complete.

For prevailing prices see latest supplementary price list.

IMPROVED ILLUSTRATORS' DRAWING TABLES

Iron Bases, Enamel Finish.

No. 3511 with No. 3516B



No. 3513 with No. 3516D

No. 3510 "Chico" Drawing Table, with basswood top 20x26 inches..... $11.50
No. 3511 "Chico" Drawing Table, with basswood top 23x31 inches..... 11.75

For accessories for "Chico" Drawing Tables see bottom of page.

"Chico" Drawing Tables Nos. 3510-3511 have a firm iron stand and can be adjusted from 38 to 50 inches in height. The top may be adjusted to any desired slant, from horizontal to vertical.

No. 3513 "Concord" Drawing Table, with antique oak top 23x26 inches..... $16.00
No. 3514 "Concord" Drawing Table, with basswood top 20x26 inches..... 14.25
No. 3515 "Concord" Drawing Table, with basswood top 23x31 inches..... 14.50

For accessories for "Concord" Drawing Tables see below.

"Concord" Drawing Tables Nos. 3513-3515 may be adjusted in height from 30 to 41 inches by means of a rack and pinion adjusting device operated by a large handwheel. The adjusting can be easily operated with one hand. The top can be tilted from a horizontal to a vertical position and clamped at any desired angle.

Accessories for Illustrators' Drawing Tables

No. 3516A Iron Folding Arm with oak shelf..... $1.75
No. 3516B Iron Folding Arm with shelf and drawer with lock..... 2.75
No. 3516C Top Shelf without drawers, antique oak finish..... 2.25
No. 3516D Top Shelf with two drawers, antique oak finish..... 3.25

(Top Shelves Nos. 3516C-3516D always remain horizontal, no matter at what angle the board is tilted.)

No. 3516E Detachable Iron Footrest 1.75

Any of the above Drawing Tables can be furnished with tops of other sizes and made of any other wood, if so desired. Prices on application.

All above prices are F. O. B. San Francisco and cover crating for shipment.

For prevailing prices see latest supplementary price list.

THE "AVALON" DRAWING TABLE

With Roller Adjustment

No. 3520

The Avalon Drawing Table is very substantial and rigid. It is 36 inches high and can be raised to 48 inches. This can be accomplished by turning the large handwheel. The slides are carried between roller bearings on the standards, and move with perfect freedom from friction, and without the grating sound of sliding metal surfaces.

The slides may be locked at any desired height, by means of a hand nut easily reached by one hand while the wheel is being manipulated by the other. The tightening of this nut releases the inner roller and substitutes a frictional bearing on bases attached to the standards, forming an efficient clamp. In addition, by the same operation, the ends of the pinions are locked against the faces of the slides, rendering their revolution impossible and doubling the security of the clamp.

Prices include best quality pinewood Drawing Board No. 3450.

		Each
No. 3520	Avalon Drawing Table, with pinewood top 31x42	$32.50
	Avalon Drawing Table, with pinewood top 33x55	35.90
	Avalon Drawing Table, with pinewood top 36x48	35.50
	Avalon Drawing Table, with pinewood top 36x60	37.50
	Avalon Drawing Table, with pinewood top 36x72	43.50
	Avalon Drawing Table, with pinewood top 42x60	42.50
	Avalon Drawing Table, with pinewood top 42x72	45.50
	Avalon Drawing Table, with pinewood top 48x72	51.50
No. 3520A	Avalon Drawing Stand only, without board	27.50

Note: All prices F. O. B. San Francisco.

ACCESSORIES FOR AVALON DRAWING TABLE

No. 3521A	Folding arm with shelf. Each	$2.50
No. 3521B	Folding arm with shelf and drawer with lock. Each	3.75
No. 3521C	Bracket with two-drawer cabinet with locks. Each	6.00

Parallel Straightedges Nos. 3407 and 3408 can be attached to the Avalon Drawing Table. See page 466.

THE "CLAREMONT" DRAWING TABLE

With Rack and Pinion Adjustment

No. 3525

The "Claremont" is one of the most popular iron-based tables. It is very strong and rigid, and its efficiency is unequaled. It is easily adjusted, having a tilting movement from horizontal to perpendicular, and it can be adjusted in height from 30 to 45 inches. The vertical adjustment is accomplished by a rack and pinion movement. The castings are well ribbed and work smoothly. The table may be rigidly clamped at any desired height or angle.

Prices include best quality pinewood Drawing Board No. 3450.

		Each
No. 3525	Claremont Drawing Table, with pinewood top 31x42.....	$26.50
	Claremont Drawing Table, with pinewood top 33x55.....	30.00
	Claremont Drawing Table, with pinewood top 36x48.....	29.50
	Claremont Drawing Table, with pinewood top 36x60.....	34.75
	Claremont Drawing Table, with pinewood top 36x72.....	41.00
	Claremont Drawing Table, with pinewood top 42x60.....	39.75
	Claremont Drawing Table, with pinewood top 42x72.....	43.00
	Claremont Drawing Table, with pinewood top 48x72.....	49.00

Note: All prices F. O. B. San Francisco.

If Claremont Drawing Stand only is wanted, without board, deduct price of board No. 3450 from the above list.

ACCESSORIES FOR CLAREMONT DRAWING TABLE

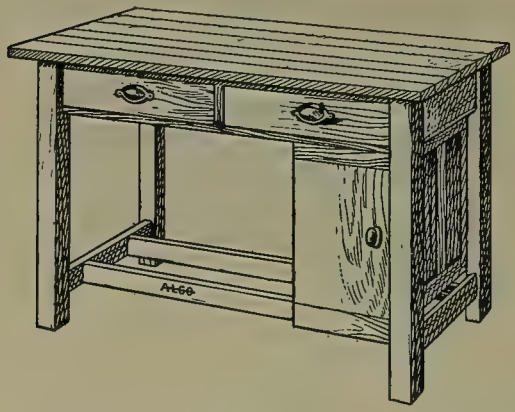
No. 3525A	Folding arm with shelf. Each.....	$2.50
No. 3525B	Folding arm with shelf and drawer with lock. Each.....	3.75
No. 3525C	Bracket with two-drawer cabinet with locks. Each.....	6.00

Parallel Straightedges Nos. 3407 and 3408 can be attached to the Claremont Drawing Table. See page 466.

For prevailing prices see latest supplementary price list.

WOODEN DRAWING TABLES, STANDS AND CABINETS

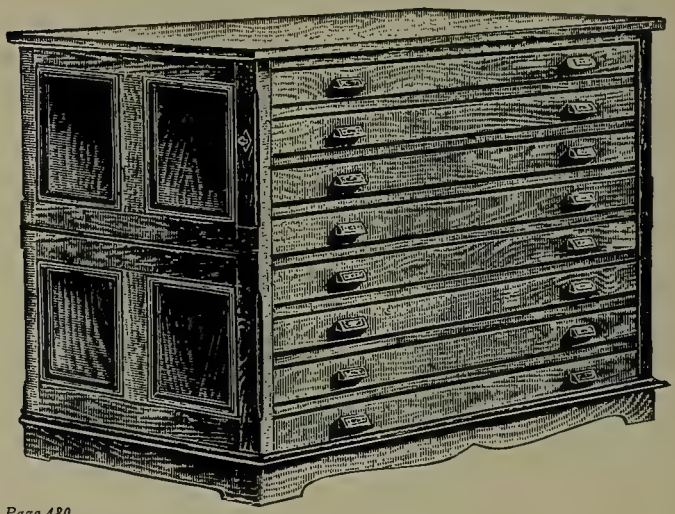
Any design or size made to order.



We have factory facilities for manufacturing Drawing Tables, Stands or Filing Cabinets of any kind, either in single lots or in large quantities.

Estimates cheerfully furnished on any design or specification sent us.

First-class workmanship and prompt delivery guaranteed.



THE "FRESNO" DRAWING TABLE

Shipping weight, 250 pounds.

No. 3530

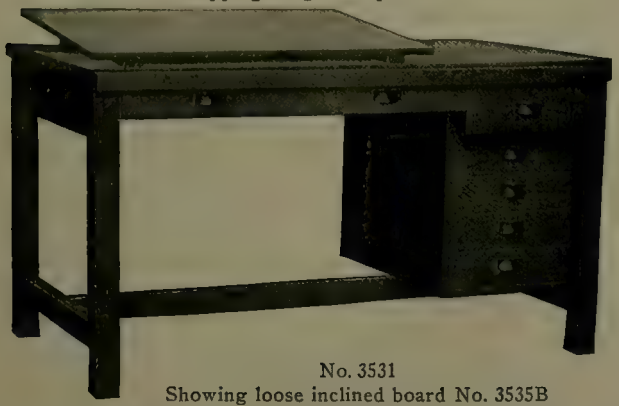
Showing loose inclined board No. 3535B

No. 3530 Fresno Drawing Table, 34 inches high, oak, pinewood drawing board top 34x72 inches. Two small drawers 18x24x4 inches inside, in two compartments, 18x18 and 16x18. One large drawer, 26x38x2 inches inside. Set of four raising blocks, 1, 2 or 3 inches high. Each $40.00

Price F. O. B. San Francisco.

THE "STANFORD" DRAWING TABLE

Shipping weight 225 pounds.



No. 3531

Showing loose inclined board No. 3535B

No. 3531 Stanford Drawing Table, 34 inches high, oak, pinewood drawing board top 33x60 inches. One small drawer 13x26x4 inches inside, in two compartments, 13x18 and 13x7½. Four small drawers 13¾x24¼x3¾ inches inside, and one large drawer 26x38x2¼ inches inside. Set of four raising blocks, 1, 2 or 3 inches high. Each $40.00

Price F. O. B. San Francisco.

Extras for above tables see page 482.

For prevailing prices see latest supplementary price list.

THE "BERKELEY" DRAWING TABLE

No. 3532

Showing adjustable drawing board top No. 3535A.
Shipping weight: No. 3532, 300 lbs. No. 3533, 400 lbs.

No. 3532 Berkeley Drawing Table, 34 inches high, oak, stationary pinewood drawing board top 34x72 inches. Two small drawers, 18x24x4 inches inside, in two compartments, 18x18 and 16x18. Six large drawers 26x38x2 inches inside, with six-inch lid at top and back to prevent drawings from slipping out. Set of four raising blocks, 1, 2 or 3 inches high. Each..... $60.00

Price F. O. B. San Francisco.

No. 3533 Berkeley Drawing Table, 34 inches high, oak, stationary pinewood drawing board top 39x84 inches. Two small drawers 21x24x4 inches inside, in two compartments, 18x21 and 6x21 inches. Six large drawers 32x44x2 inches inside, with six-inch lid at top and back to prevent drawings from slipping out. Set of four raising blocks, 1, 2 or 3 inches high. Each..... 67.50

Price F. O. B. San Francisco.

EXTRAS FOR DRAWING TABLES

The following extras can be supplied in connection with our Drawing Tables Nos. 3530, 3531, 3532 and 3533:

	Each
No. 3535A Adjustable Drawing Board Top in lieu of stationary top.....	$3.50
No. 3535B Loose Inclined Drawing Board, 31x42 inches.....	5.00
Loose Inclined Drawing Board, 27x34 inches.....	3.75
No. 3535C Tool Tray and Frame fitted to tool drawer.....	1.75
No. 3535D Lock for drawers, ordinary, 2 keys for each.....	.50
No. 3535E Holding-down wires. Per pair	.25

Tables made to order. See page 480.

For prevailing prices see latest supplementary price list.

THE "METROPOLIS" DRAWING TABLE

Shipping weight, about 375 pounds.

No. 3539

No. 3539 Metropolis Drawing Table, oak, antique finish, adjustable pinewood Drawing Board top 36x52 inches, on sliding frame to pull out to give knee room. Seven drawers, 32x44 inches inside, with six-inch lid at top and back to prevent drawings from slipping out. Sanitary base. Each..... $75.00

Price F. O. B. San Francisco.

No. 3540 Metropolis Drawing Table, oak, antique finish, adjustable pinewood Drawing Board top 36x60 inches, on sliding frame to pull out to give knee room. Seven drawers, 32x53 inches inside, with six-inch lid at top and back to prevent drawings from slipping out. Sanitary base. Each..... 82.50

Price F. O. B. San Francisco.

The Metropolis Drawing Tables can be equipped with parallel straightedges No. 3407 or 3408. See page 466.

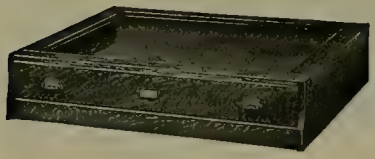
For prevailing prices see latest supplementary price list.

SECTIONAL FILING CASES

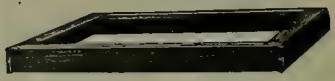
No. 3545

"A"
One-Drawer Section.

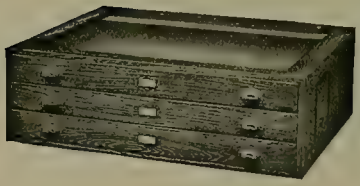
"E"
Oak Top.



"B"
Base with one drawer.

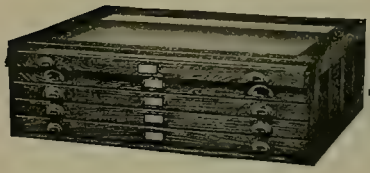


"F"
Plain Base.



"C"
Three-Drawer Section.

"G"
High Sanitary Base.



"D"
Five-Drawer Section.

"H"
Low Sanitary Base.

For description and prices see opposite page.

SECTIONAL FILING CASES

For illustrations see opposite page.

These Cabinets are of the best workmanship and are of uniform size and always the same so that any variety of sections may be procured at any time and they will always fit perfectly. All joints are dovetailed and well glued, reinforced with glue blocks, making the cases firm and durable. The drawers slide in grooves, with no rails between them and are furnished with a six-inch lid at top and back to prevent drawings from slipping out.

Finished in golden oak, with oxidized drawer pulls and label holders.

	Inside Length Inches	Width of Drawers Inches	Depth of Drawers Inches	Outside Length Inches	Width Over All Inches	Height Over All Inches	Shipping Weight Pounds	List Prices
No. 3545 Sectional Filing Cases.								
Section "A"—One-drawer section	42½	32	7	45½	34½	9¼	95	$13.80
" "B"—Base with one drawer	42½	32	6¼	45½	34½	9¼	95	13.20
" "C"—Three-drawer section	42½	32	3⅝	45½	34½	14½	145	25.80
" "D"—Five-drawer section	42½	32	2	45½	34½	14½	150	27.00
" "E"—Oak top only	....	....	....	45½	35¼	3	75	9.00
" "F"—Plain base	....	....	....	45½	34½	4	35	6.00
" "G"—High sanitary base	....	....	....	45½	34½	22¾	70	11.75
" "H"—Low sanitary base	....	....	....	45½	34½	5¾	30	6.00

Prices F. O. B. San Francisco.

COMBINATION FILING CABINET

No. 3548

This combination Filing Cabinet consists of a low sanitary base and 2 five-drawer sections (for dimensions see Section "D," Catalogue No. 3545). The top is a fine pinewood drawing board, so arranged that it can be pulled forward to project about four inches beyond the edge of the Cabinet, can be raised and lowered on the level from 35 to 43 inches, and can be tilted at any angle. The parts are securely fastened together, making a very rigid outfit.

Equipped with a swinging arm with tray and drawer.

Finished in golden oak, with oxidized drawer pulls and label holders.

	Each
No. 3548A Combination Filing Cabinet, adjustable drawing board top 37x60 inches..	$89.50
No. 3548B Combination Filing Cabinet, adjustable drawing board top 42x72 inches..	97.50

Prices F. O. B. San Francisco.

For Steel Sectional Filing Cabinets see page 487.

For prevailing prices see latest supplementary price list.

SECTIONAL FILING CASES

No. 3550.

The above Cabinet consists of the following sections:

1 Plain Base with one drawer, Section "B"	$13.20
3 Five-drawer Sections, Section "D," @ $27.00	81.00
1 Oak Top, Section "E"	9.00
No. 3550 Sectional Filing Case, complete as shown	$103.20

Prices F. O. B. San Francisco.

The above Cabinet is merely a suggestion. All the sections listed under Catalogue No. 3545 on pages 488 and 489 are of uniform size, and any combination of sections will fit perfectly. This permits of the adding of sections of drawers, should at any time it be found necessary to increase the filing space.

All drawers are furnished with six-inch lid at top and back to prevent drawings from slipping out.

For prevailing prices see latest supplementary price list.

STEEL SECTIONAL FILING CABINETS

These Cabinets are made of cold rolled furniture steel, which has been reannealed and pickled to remove all foreign matter and leveled to eliminate buckling.

Being entirely of steel they are practically indestructible. Changes of atmosphere do not swell or shrink the drawers, and they are a protection against destruction by fire. The angle runs insure ease of operation regardless of weight of contents of the drawers.

Finished in olive green enamel, smooth and hard in surface, with a rich dull effect. The drawer pulls and label holders are of stamped brass, satin finish.

....."E" Top only

...."DD" Six-Drawer Section

(Illustration shows Five-Drawer Section, now discontinued.)

...."C" Three-Drawer Section

...."H" Sanitary Base

No. 3575

		Inside Dimensions			Outside Dimensions			
		Length	Width	Depth of Drawers	Length	Width	Height	Price
No. 3575 Steel Sectional Filing Cases.								
Section	"E"—Top only	....	....	....	46½"	35"	1"	$7.20
"	"DD"—Six-Drawer section	43"	32"	2¼"	46½"	35"	18"	84.00
"	"C"—Three-Drawer section	43"	32"	4¼"	46½"	35"	15½"	54.00
"	"F"—Plain flush base	....	....	....	46½"	35"	2½"	7.20
"	"H"—Sanitary base	....	....	....	46½"	35"	12"	11.00

Prices F. O. B. San Francisco.

THE DRAWERS

The drawers are furnished in back with a stationary metal lid, and in front with a folding metal lid to prevent the drawings from slipping out. They can be divided into four compartments 21¼x15¾, or into two compartments 21¼x32 inches, at the following additional prices:

	Each
No. 3575B Drawer divided into two compartments, 21¼x32 inches	$2.50
No. 3575C Drawer divided into four compartments 21¼x15¾ inches	5.00

The above prices include metal folding lids for each compartment.

For prevailing prices see latest supplementary price list.

DRAFTSMEN'S STOOLS

No. 3580

No. 3581

No. 3582

	Each
No. 3580A Draftsman's Stool, wood seat, 30 inches high	$1.65
No. 3580B Draftsman's Stool, wood seat, 36 inches high	1.65
No. 3580C Draftsman's Stool, cane seat, 30 inches high	1.85
No. 3580D Draftsman's Stool, cane seat, 36 inches high	1.85
No. 3581A Draftsman's Stool, wood seat, adjustable from 30 to 35 inches high	4.50
No. 3581B Draftsman's Stool, cane seat, adjustable from 30 to 35 inches high	4.75
No. 3582A Draftsman's Stool, wood seat, adjustable from 30 to 35 inches high, with ring for foot rest	5.00
No. 3582B Draftsman's Stool, cane seat, adjustable from 30 to 35 inches high, with ring for foot rest	5.25

FELT STOOL COVERS

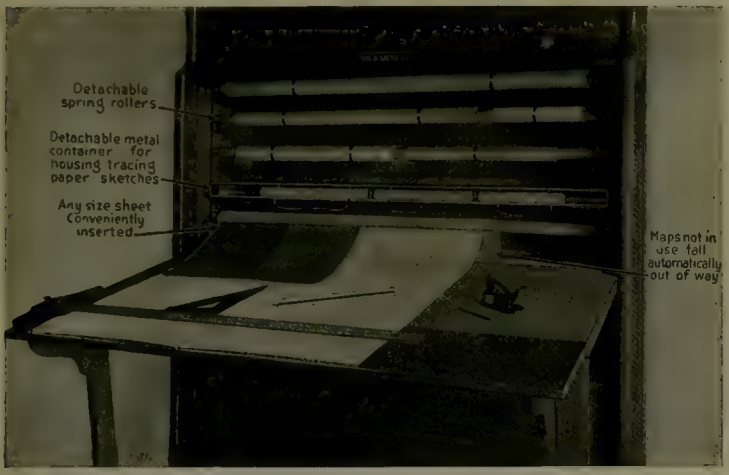
	Each
No. 3585 Brown Felt Stool Covers	$1.00
No. 3586 Brown or Green Felt Stool Covers, extra heavy	1.50

Felt Stool Covers save the clothes and prevent shine on the trousers. Should be on every stool.

For prevailing prices see latest supplementary price list.

THE DREW METHOD FILING CABINET

The Drew Method of Filing as manufactured by us was primarily conceived to overcome the lost floor space as occupied by the drawer method and the inconvenience of taking drawings therefrom. **Compactness and accessibility are paramount.** The drawer method of filing needs no mention from us as to its faults, for anyone who has had to resort to maps or drawings when filed in this manner knows of its shortcomings. It can today only be regarded as obsolete.



Maps may be altered without detaching.
No. 3590—Illustration 1.

The **Drew Method Filing Cabinet** consists of a Cabinet 5 feet 10 inches high and 15 inches deep, on which sections 18 or 36 inches in height may be added as additional filing space is required.

The maps are attached to detachable spring rollers, or thin tracing paper sketches can be conveniently filed in metal containers. An idea of the filing capacity of the **Drew Method Filing Cabinet** can be gained when one realizes how easily 15 maps of varying sizes and lengths can be mounted in juxtaposition on each roller. When required the desired map can be drawn from its position on the roller for examination, which the other maps on the same roller will fall automatically out of the way. The front of the cabinet, when lowered, serves as a table, on which the maps may conveniently be examined or altered, without detaching from the roller. When fully wound, the maps are kept from unraveling by means of metal spring clamps.

Thin tracing paper sketches are filed in the metal containers and can easily be taken out for examination by means of pull-cords which slip under the tracings.

The rollers and metal containers are made in two standard widths, 45 and 60 inches, and are hung about 5 inches apart on two endless chains which revolve on geared wheels, so that any roller or container can be instantly brought in position for examination. The rollers and metal containers are interchangeable and the desired number of each can be furnished.

THE DREW METHOD FILING CABINET

Illustration No. 2

Illustration No. 2 shows **Drew Method Filing Cabinet** when closed. This cabinet is 5 ft. 10 in. high, on top of which rests a section 18 in. high. Extra units may be added to admit the heightening of the cabinet when additional rollers are needed.

The cabinet as shown embodies 36 rollers, on which maps of varying sizes and lengths can be mounted.

Illustration No. 3 shows how conveniently the **Drew Method Filing Cabinet** is lowered or closed. The table drop is counter-balanced by heavy springs, which control its action. When fully opened the front of the cabinet serves as a table consisting of a pinewood board on which alterations may be made to maps without detaching them from the rollers. The table may be enlarged by bringing the folding leaf into a lateral position, where it is firmly held by means of the two hinged supports. A footrest is also inserted for convenience wher working about the cabinet.

Illustration No. 3

The cabinets are built of either wood or steel and can be finished to match the general scheme of an office.

Write us for quotations, stating finish and capacity required.

THE DREW METHOD FILING CABINET

Illustration No. 4

Illustration No. 4 shows the **Drew Method Filing Cabinet** fully opened and in use. A long profile is drawn from its position on the roller for examination or alteration. The springs in the rollers will admit of the carrying of maps fully 25 feet long, which may be stopped (like a window shade) at any place in the length.

Illustration No. 5 shows the **Drew Method Filing Cabinet** in use when making alterations or additions to maps. The table, which is made of pinewood, serves as a drawing board. The convenience of this is self-evident when one considers the necessity of finding a suitable place in the average office for doing a similar work, in fact the **Drew Method Filing Cabinet** eliminates the need of another drawing table.

Investigate the merits of the Drew Method Filing Cabinets.

Illustration No. 5

THE BAXTER FILING SYSTEM

This system of filing of drawings was brought forth by F. K. Baxter, of one of the Oil Companies of California.

Confronted with the old problem of limiting the space required for the filing of the company's drawings, Mr. Baxter set about to conceive a method of throwing out, rather than adding to, the already large number of drawing cabinets in use by the company; floor and room space was in demand and limited. Necessity certainly proved the mother of invention in this instance.

The illustration on opposite page shows over 1600 drawings of all sizes, lengths and widths most conveniently hung in place. The drawings, negatives or tracings are reinforced at the upper end with strips of heavy gummed paper, which will support the heaviest maps without tearing, suitably punched to be placed on pins suspended on rods fastened to traveling carriages about 12 inches wide when closed and in series, permitting of a separation to allow for the examination of the maps, thus affording accessibility to the cabinet, as shown in illustration.

Invariably one wishes but to examine a drawing for the purpose of ascertaining the location of some property or bearing. It is only necessary to run the hand between drawing and the adjoining sheet (after locating the desired copy by means of the index) to examine it at will or without interference.

But should it be necessary to take the map from its place in the cabinet, the gun-shaped hand (standing at end against folding door shown in illustration) is inserted in back of the desired map and a small locking pin is pulled down, opening the carriage. The maps on the one side remain locked on the carriage by means of the gun-shaped hand while the rest travel away from it. The map is then brought forth to be printed, examined or retraced, as the case may necessitate. An index card is placed in the rack in lieu of the map, on which is noted the whereabouts of the map proper. When the map is no longer required, it is placed upon a suitable rack at end of cabinet (as shown in illustration) until evening, when all are readily placed in their proper location in the file, the person filing being guided by the index number on the edge of the drawings.

A curtain shade is drawn down over the whole when not in use, the folding iron gate is swung into place and the cabinet containing all the valuable drawings is secure against molestation.

State your required capacity, the dimensions of your allowable or suitable space and we will work out your problem and quote you accordingly.

THE BAXTER FILING SYSTEM

The carriages can be purchased with required length of track singly or in series, to which others can be added later, making it possible to install them in vaults or other fireproof compartments. We can also quote the cabinet complete constructed of either wood or steel.

DRAWING BOARD AND LIBRARY PASTES

No. 3600

No. 3602

No. 3600 Higgins' Drawing Board Mucilage. A novel semi-fluid adhesive of great strength and body, especially prepared for sticking paper to the drawing board.

In glass, screw-capped jars—	3 oz.	6 oz.	14 oz.	½ gal.	Gal.
Each	$0.15	$0.25	$0.50	$2.00	$3.50

No. 3602 Higgins' Photo Mounter. A superior adhesive especially prepared for mounting photographs, scrap pictures, engravings, etc., and for general use as a substitute for fluid mucilage.

In glass, screw-capped jars—	3 oz.	6 oz.	14 oz.	½ gal.	Gal.
Each	$0.15	$0.25	$0.50	$2.00	$3.50

No. 3605

No. 3607

No. 3605 Higgins' Office Paste.

In glass, screw-capped jars—	4 oz.	8 oz.	½ gal.	Gal.
Each	$0.15	$0.25	$1.50	$2.75

No. 3607 Sanford's Library Paste.

In Utopian jars—	5 oz.	8 oz.	Pint	Quart
Each	$0.40	$0.60	$0.85	$1.25

A brush is furnished with every jar of paste.

MUCILAGE AND GLUE

No. 3610

No. 3612

No. 3610 Higgins' Taurine Mucilage. A new, clear, non-corrosive, non-sedimentary mucilage. Stronger, catches quicker and dries faster than other mucilages, and is of pleasant odor.

In bottles, with brush—	2 oz.	4 oz.	½ pint	Pint	Quart
Each	$0.10	$0.20	$0.30	$0.50	$0.80

No. 3612 Higgins' Vegetable Glue.

In cans—	½ lb.	1 lb.	2 lbs.	5 lbs.	10 lbs.
Each	$0.15	$0.25	$0.50	$1.00	$1.75

No. 3614A (bottle)

No. 3614C (can)

No. 3614A Le Page's Liquid Glue.

In glass bottles—	1 oz.	2 oz.
Each	$0.10	$0.15

No. 3614B In tubes—

	1 oz.	2 oz.
Each	$0.10	$0.15

No. 3614C In patent tin cans—

	½ gill	Gill	½ pint	Pint	Quart	½ gal.	Gal.
Each	$0.15	$0.25	$0.30	$0.50	$0.80	$1.60	$3.00

For prevailing prices see latest supplementary price list.

LIQUID DRAWING INKS

No. 3618

No. 3630

HIGGINS' AMERICAN DRAWING INKS

WATERPROOF DRAWING INK

The Waterproof Drawing Inks Nos. 3618-21 are insoluble when dry, and are the best for working drawings which have to stand handling, moisture or color washes.

Made in Black and the Following Colors:

A—Blue	D—Carmine	G—Orange	J—Violet
B—Brickred	E—Green	H—Scarlet	K—Yellow
C—Brown	F—Indigo	I—Vermilion	

		Each
No. 3618	Higgins' Waterproof Drawing Ink, black or colors, ¾-oz. bottle	$0.25
No. 3619	Higgins' Waterproof Drawing Ink, black or colors, ½-pint bottle	2.00
No. 3620	Higgins' Waterproof Drawing Ink, black or colors, 1-pint bottle	3.75
No. 3621	Higgins' Waterproof Drawing Ink, black or colors, 1-quart bottle	7.00

Extra Small Bottle Black Waterproof Drawing Ink

No. 3622 Weber's Waterproof Drawing Ink, black only, ½-oz. bottle $0.10

GENERAL DRAWING INK

The General Drawing Ink Nos. 3625-28 (black only) is soluble and is the best for India Ink tints and washes, for tracing, for patent office and photo drawings and all fine line work.

No. 3625	Higgins' General Drawing Ink, black only, ¾-oz. bottle...	$0.25
No. 3626	Higgins' General Drawing Ink, black only, ½-pint bottle..	2.00
No. 3627	Higgins' General Drawing Ink, black only, 1-pint bottle...	3.75
No. 3628	Higgins' General Drawing Ink, black only, 1-quart bottle..	7.00

BOURGEOIS' LIQUID DRAWING INK

Black Only

No. 3630	Bourgeois' Waterproof Black Drawing Ink, small bottle..	$0.25
No. 3631	Bourgeois' Waterproof Black Drawing Ink, large bottle...	.50

EMPTY INK BOTTLES

		Doz.	Each
No. 03618	Empty Drawing Ink Bottles, quill filler, ¾ oz.....	$1.20	$0.10

HOW TO DILUTE THE INKS

If the black inks should require to be thinned or diluted, use distilled water with a little aqua ammonia—four drops to the ounce of water. To dilute the colored inks use distilled water only. Never add any acid or mix with other inks.

INK BOTTLE HOLDERS

No. 3635

ALTENEDER'S DRAFTSMAN'S PEN-FILLING INKSTAND

This accessory enables the draftsman to fill his pen in the shortest possible time, and by the use of one hand alone, leaving the other at liberty to hold the T-square, triangle, etc. It will serve as a paperweight and the stand being sufficiently heavy offers a stability the need of which is so strongly felt when working without a holder for the bottle. Provided with an automatic stopper, most efficient in preventing evaporation, and the new form of dipper will instantly and positively deliver an ample and uniform charge with no tendency whatever to ink the outside of the blades. Made of cast iron, japanned.

No. 3635 Alteneder's Draftsman's Pen-Filling Inkstand. Each..... $1.50

No. 3636 No. 3638

No. 3636 The "Clover" Ink Bottle Holder, for three bottles. Each.. $0.50

No. 3638 Iron Ink Bottle Holder and Paperweight. Each..... .35

Iron Ink Bottle Holder No. 3638 is of neat design and simple construction. Two lugs attached to the top are inserted in two openings of the base and the top is given a quick turn, securely clamping it to the base. The holder will accommodate any standard ¾-oz. ink bottle. Oxidized copper finish.

No. 3640

No. 3640 Drawing Ink Tray, for five bottles. Each..... $0.35

For "Inkwash" for removing black drawing ink from tracing cloth, see page 249.

CHINESE OR INDIAN INK IN STICKS

No. 3645

	Each
No. 3645A Oval, lion head, 2½ inches long	$0.15
No. 3645B Oval, lion head, 3¼ inches long	.25
No. 3645C Square, genuine, Super, 2⅞ inches long	.35
No. 3645D Square, genuine, Super, 3¾ inches long	.65
No. 3645E Oblong, gilt figures, 3⅞ inches long	1.50
No. 3645F Oblong, extra fine quality, 2⅞ inches long	2.70
No. 3645G Oblong, extra fine quality, 3⅝ inches long	3.00

BROKEN INDIA INK

No. 3646 Broken India Ink, assorted. Per pound $3.75

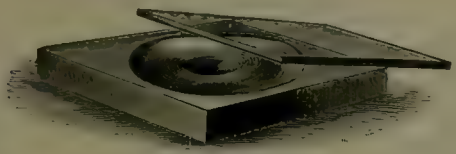
COLORED INDIAN INK IN STICKS

No. 3648

	Each
No. 3648A Dragon, Indian blue	$0.25
No. 3648B Dragon, Indian reddish brown	.25
No. 3648C Dragon, Indian yellow	.25
No. 3648D Dragon, Indian red (vermilion)	.25
No. 3648E Dragon, Indian red lake	.35

For prevailing prices see latest supplementary price list.

SLATE INK SLABS



No. 3650

This Slate Ink Slab is the most practical for rubbing up Chinese or Indian Inks quickly and uniformly. The well in the center is deep to allow convenient filling of pen, and the plate-glass cover is airtight.

	Each
No. 3650 Slate Ink Slab with glass cover, 3½x3½ inches.....	$0.35

ALBANINE AND PROCESS BLACK

For Drawing in Black and White for Reproduction

No. 3652

No. 3654

By the use of Albanine and Process Black the difficulty hitherto experienced of preserving the true values of the lights, in drawings made for Process reproduction, is entirely obviated.

No. 3652 Process Black, a dead black of great density, per jar.....	$0.35
No. 3654 Albanine, a pure photographic white, per jar.....	.35

No. 3656

GOLD AND SILVER INKS

	Full size	Half size
No. 3656 Gold Ink, per bottle.....	$0.30	$0.15
No. 3657 Silver Ink, per bottle.....	.30	.15

OFFICE INKS

No. 3662

No. 3664

No. 3666

No. 3662 Higgins' Eternal Ink. A fine, fluent carbon writing ink for general use.

	2 oz.	½ pint	1 pint	Quart
Each	$0.10	$0.35	$0.60	$1.00

No. 3664 Higgins' Engrossing Ink. A fine, fluent carbon writing ink for use of the artist and show-card writer.

	2 oz.	½ pint	1 pint	Quart
Each	$0.20	$0.60	$1.00	$1.75

No. 3666 Carter's Fountain Pen Fluid. A blue-black writing fluid, for fountain pen or general office use.

	2 oz.	4 oz.*	½ pint	1 pint	Quart
Each	$0.10	$0.25	$0.40	$0.75	$1.10

*4 oz. bottle Carter's Fountain Pen Ink, with combined stopper and filler and aluminum screw cap.

INK ERASER

No. 3666

No. 3666 Carter's Ink Eraser, for removing ink spots. Per outfit... $0.25

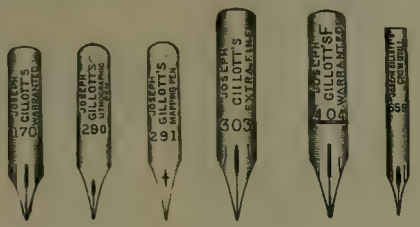
Carter's Inky Racer will remove writing ink from paper only.
Also see Inkwash, page 249, for removing ink from tracing cloth.

For prevailing prices see latest supplementary price list.

STEEL PENS

For Drawing and Lettering

JOSEPH GILLOTT'S STEEL PENS



In One-Gross Boxes—Pens Loose

	Gross	Doz.
No. 170 Ladies' Pen, extra fine points	$1.05	$0.10
No. 290 Lithographic and Drawing Pen, superfine points	4.95	.50
No. 291 Mapping, Drawing and Engraving Pen	4.95	.50
No. 303 The Original Extra Fine Pen	1.45	.15
No. 404 Public Pen with bead, fine points	.85	.10
No. 659 Crow Quill, superfine drawing points	5.50	.50

In One-Gross Boxes—12 Pens on a Card, with Penholder

	Gross	Doz.
No. 290 Lithographic and Drawing Pen, superfine points	$6.50	$0.60
No. 291 Mapping, Drawing and Engraving Pen	6.50	.60
No. 659 Crow Quill, superfine drawing points	6.50	.60
No. 850 Long Shoulder Crow Quill, superfine points	8.10	.75
No. 1000 Tit Quill. The finest points	11.00	1.00
No. 1068 Rigid Extra Fine. An especially smooth pen for unshaded extra fine writing	1.50	.15

For extra Penholders see page 502.

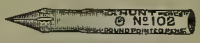
For prevailing prices see latest supplementary price list.

HUNT'S PENS

For Drawing and Lettering

No. 100 Artist Pen, for lithographers.

	¼ Gr.	Gross	Doz.	Each
Pens loose in box	$0.40	$1.50	$0.15	....



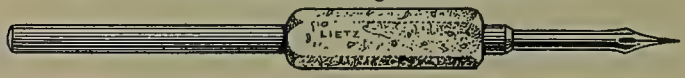
No. 102 Crow Quill Pen. Each pen in a black penholder.

One dozen pens and one dozen holders on card	¼ Gr.	Gross $12.00	Doz. $1.00	Each $0.10
Pens loose in box	$1.50	5.00	.50	.05

No. 107 Hawk Quill Pen. Extra fine point, more stiff than No. 102.

Each pen in a black penholder and one dozen holders on card	¼ Gr.	Gross $12.00	Doz. $1.00	Each $0.10
Pens loose in box	$1.50	5.00	.50	.05

CORKO CROW QUILL PENS



No. 3690

	Gross	Doz.	Each
No. 3690 Crow Quill Pens with improved holders with cork finger piece. One dozen pens and one dozen holders on card.....	$12.00	$1.00	$0.10

PENHOLDERS FOR GILLOTT'S AND HUNT'S PENS

No. 3695

No. 3697

	Doz.	Each
No. 3695 Ebony Penholder for Crow Quill Pens, extra fine..	$1.00	$0.10
No. 3696 Ebony Penholder for Crow Quill Pens, plain	.50	.05
No. 3697 Polished Cedar Penholder for Mapping Pens.....	.50	.05

For other Penholders see page 507.

LEONHARDT'S BALL POINTED PENS

No. 506F

No. 510EF

No. 516EF

No. 526

Note: F denotes Fine, EF denotes Extra Fine.

Leonhardt's Ball Pointed Pens.

	Gross	Doz.
Nos. 506F, 506EF, 516F, 516EF and 526.....	$1.35	$0.15

Leonhardt's Aluminum Ball Pointed Pens.

Nos. 510F and 510EF	1.35	.15

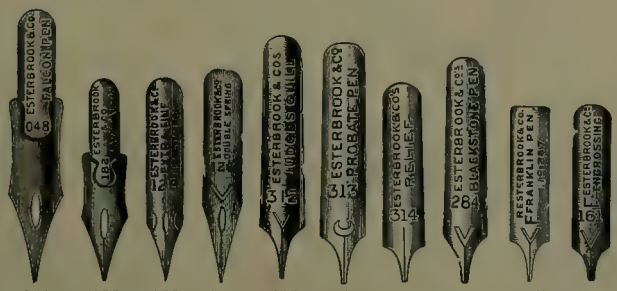
These Pens are somewhat finer than the steel ball pointed pens.

SPENCERIAN STEEL PENS

No. 1 College, fine point, double elastic action.
Per gross..... $1.00 Per doz..... $0.10

No. 9 Bank, long and flexible point.
Per gross..... $1.00 Per doz..... $0.10

ESTERBROOK'S WRITING PENS



Nos. 048 182 128 126 312 313 314 284 267 161

Esterbrook's Writing Pens. Order by Number

Any of the above Pens, per gross..... $0.75 Per doz..... $0.10

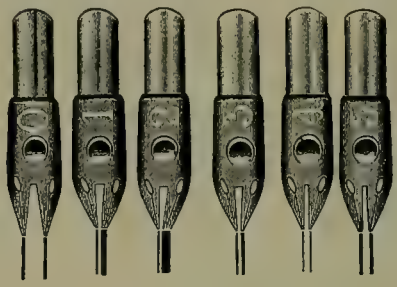
For Penholders see page 511.

For prevailing prices see latest supplementary price list.

ROUND WRITING PENS

No. 3725

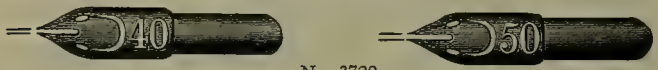
No. 3725 Round Writing Pens, single pointed. (Order by number.)	Gross	¼ gross	Doz.
Any one kind of the above Nos.	$1.00	$0.25	$0.10
No. 3725A Assortment of 12 Single Pointed Pens on card. Per card			.15



No. 3726

No. 3726 Round Writing Pens, double pointed. (Order by number.)	Gross	¼ gross	Doz.
Any one kind of the above Nos.	$1.30	$0.65	$0.10
No. 3726A Assortment of 12 Double Pointed Pens, 2 of each kind, on card. Per card			.25
No. 3726B Assortment of 25 Single and Double Pointed Pens in box. Per box			.40

ROAD PENS



No. 3728

No. 3728 Road Pens Nos. 40 and 50. (Order by number.) These pens have two fine equal points, and are used for road drawing.	¼ gross	Doz.
Any one kind of the above Nos.	$0.65	$0.35

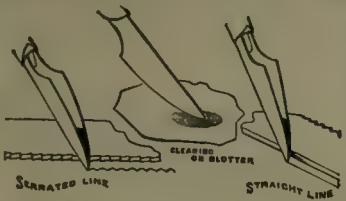
No. 3730 No. 3731

	Box of 10	Each
No. 3730 Inkholders for Single and Double Pointed Pens	$0.40	$0.05
No. 3731 Penholders for Round Writing Pens	....	.10

Books on Round Writing, see Book List.

GISBURNE'S RULING PENS

Of fine grade, with specially ground and polished point, as used by all the Government Departments at Washington, D. C.



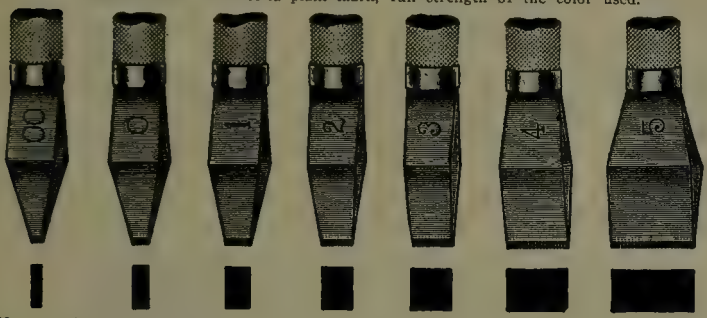
Superior to any other Pen for Preparing Tables Statements, Schedules and Diagrams or for Ruling Insurance Policies, Certificates, Ledgers, Briefs, Music Etc.

An excellent Ruling Pen at a nominal cost. Will fit in any ordinary penholder. Made in three sizes, Fine, Medium and Coarse.

No. 3735A Gisburne's Ruling Pens, Fine, 6 Pens on card $0.60
No. 3735B Gisburne's Ruling Pens, Medium, 6 Pens on card ..... .60
No. 3735C Gisburne's Ruling Pens, Coarse, 6 Pens on card ..... .60

AUTOMATIC MARKING PENS

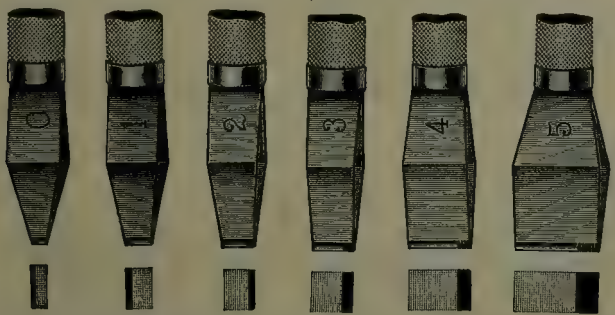
These Pens make a solid plain mark, full strength of the color used.



No. 3737 Automatic Marking Pens, Nos.	00	0	1	2	3	4	5	Each
Width of Nib, inches.....	1/16	3/32	1/8	1/16	1/4	3/8	1/2	$0.20

AUTOMATIC SHADING PENS

These Pens make a mark of two shades at a single stroke of the pen from one color ink.

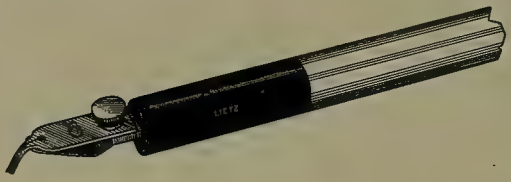


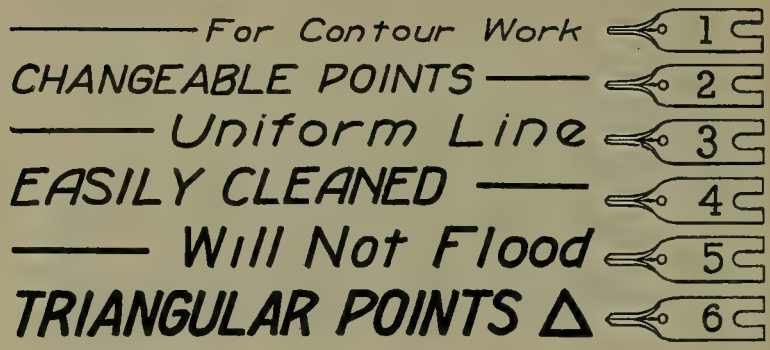
No. 3738 Automatic Shading Pens, Nos.	0	1	2	3	4	5	Each
Width of Nib, inches.....	3/32	1/8	1/16	1/4	3/8	1/2	$0.20

No. 3739 Instruction Book for the use of Automatic Shading Pens..... .50

For prevailing prices see latest supplementary price list.

THE WORTH LETTERING PEN





The Worth Lettering Pen is the most recent innovation in pens particularly intended for the lettering of maps or the writing of showcards, price tags, etc. The large capacity of the ink reservoir makes it superior for drawing heavy border or long contour lines without refilling.

The improvements of the Worth Pen consist primarily of the interchangeability of the pen points, the convenient method of filling and the rapidity with which it is cleaned.

The triangular shaped point finishes each letter with a square edge.

The Worth Lettering Pens are sold either separately or in sets, consisting of one holder and six different size nibs, as per above illustration.

No. 3740 Worth Lettering Pen complete, consisting of 1 holder and 6 different size nibs, Nos. 1-6. Per set.....	$3.50
No. 3740A Worth Lettering Pen Holder only. Each.....	.75
No. 3740B Separate Nibs for Worth Lettering Pen. Order size by Nos., 1-6. Each	.50

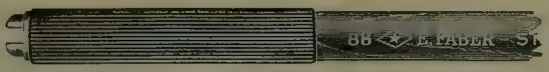
For prevailing prices see latest supplementary price list.

PENHOLDERS

	Per doz.	Each
No. 3746 "Crown" No. 1. Small, cedar, hard rubber tip. One doz. in a box..	$0.50	$0.05

	Per doz.	Each
No. 3747 "Crown" No. 2. Medium, cedar, hard rubber tip. One doz. in a box.	$0.75	$0.10

With Soft Rubber Tips



	Per doz.	Each
No. 3748 Medium. Natural polished taper cedar handle. Fluted soft white rubber tip. Projecting nibs. One doz. in a box.....	$0.75	$0.10

	Per doz.	Each
No. 3749 Medium. Assorted polished taper cedar handles. Fluted soft rubber tips in assorted colors. Bonin nibs. One doz. in a box.....	$0.75	$0.10

With Cork Tips

	Per doz.	Each
No. 3750 Medium. Assorted polishes, taper cedar handles. Cone shaped cork tips. Projecting nibs. One doz. in a box.....	$0.75	$0.10

	Per doz.	Each
No. 3751 Medium. Natural polished taper cedar handle. Cone shape cork tip. Bonin nib. One doz. in a box.....	$0.75	$0.10

KOH-I-NOOR DRAWING PENCILS

No. 3760

	Per doz.
No. 3760 "Koh-i-noor" Drawing Pencils, hexagon, yellow polish, in the following degrees: 9H, 8H, 7H, 6H, 5H, 4H, 3H, 2H, H, F, HB, B, 2B, 3B	$1.25
4B	1.50
5B and 6B	1.80

KOH-I-NOOR ARTISTS' PENCILS

No. 3762

	Each
No. 3762 "Koh-i-noor" Artists' Pencil, with movable leads, 8H, 7H, 6H, 5H, 4H, 3H, 2H, H, F, HB, B, 2B, 3B, 4B, 6B	$0.25

KOH-I-NOOR REFILL LEADS

No. 3765

	Per box
No. 3765 "Koh-i-noor" Artists' Leads, in cedarwood boxes of 6 leads, 8H, 7H, 6H, 5H, 4H, 3H, 2H, H, F, HB, B, 2B, 3B, 4B, 6B	$0.65

KOH-I-NOOR ACCOUNT BOOK PENCILS

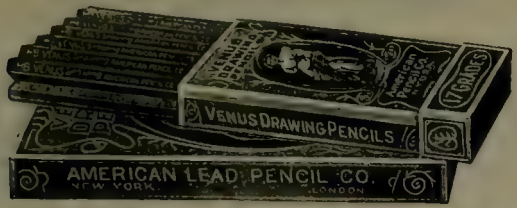
Compressed Lead, Hexagonal

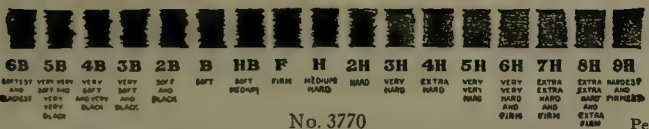
No. 3768

	Dozen
No. 3768 "Koh-i-noor" Account Book Pencil, hexagon, yellow polish, one degree	$1.25

Koh-i-noor Pencils in quantities at special net prices.

VENUS DRAWING PENCILS





No. 3770 — Per doz.

No. 3770 Venus American Drawing Pencils, hexagon, mottled green polished cedar, in the following degrees: 9H, 8H, 7H, 6H, 5H, 4H, 3H, 2H, H, F, HB, B, 2B, 3B, 4B, 5B, 6B $1.00

No. 3770R Venus American Drawing Pencils, as above with rubber, in the following degrees: F and HB 1.25

VENUS ARTISTS' PENCIL

No. 3772 — Each

No. 3772 Venus Artists' Pencil with movable leads, 9H, 8H, 7H, 6H, 5H, 4H, 3H, 2H, H, F, HB, 2B, 3B, 4B and 6B $0.25

VENUS AMERICAN REFILL LEADS

Per box

No. 3775 Venus American Refill Leads for Artists' Pencils, in cedar boxes of 6 leads, in the following degrees: 9H, 8H, 7H, 6H, 5H, 4H, 3H, 2H, H, F, HB, B, 2B, 3B, 4B, 5B, 6B $0.60

CASTELL DRAWING PENCILS

No. 3776 — Per doz.

No. 3776 Castell Drawing Pencils, hexagon, green polish, in the following degrees: 9H to 6B $1.25

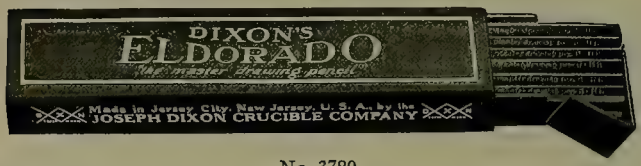
No. 3778* Castell Flat Pencils, especially adapted for Fieldbook use. In the following degrees: 4H, 2H and HB 1.25

*Illustrated on page 218.

Special quotations on any of above pencils in quantities.

For prevailing prices see latest supplementary price list.

ELDORADO DRAWING PENCILS



No. 3780

Per doz.

No. 3780 ELDORADO DRAWING PENCILS, hexagon, yellow polish, in the following degrees: 8H, 7H, 6H, 5H, 4H, 3H, 2H, H, F, HB, B, 2B, 3B, 4B..... $1.00

MONGOL PENCILS

No. 3785

Per doz.

No. 3785 MONGOL DRAWING PENCILS, hexagon, yellow polish, in the following degrees: 6H, 5H, 4H, 3H, 2H, H, F, HB, B, 2B, 3B and 6B..... $0.60

No. 3786 (Hexagon)

Per doz.

No. 3786 MONGOL PENCILS, hexagon, yellow polish, with red rubber tips, in the following grades: 1, 2, 3 and 4..... $0.60

No. 3787 MONGOL PENCILS, round, yellow polish, with red rubber tips, in the following grades: 1, 2, 3 and 4..... .60

ALCO STAR DETAIL PENCILS

No. 3790

Per gross Doz

No. 3790 ALCO STAR DETAIL PENCILS, hexagon, rosewood polish, in the following grades: 1, 2, 3, 4 and 5..... $4.00 $0.35

The Alco Star Detail Pencils are uniformly graded, free from grit, and are an excellent pencil for sketching and drawing details. We recommend them highly.

THE BLACK MONARCH PENCIL

No. 3793

Per doz.

No. 3793 "BLACK MONARCH" PENCILS, hexagon, extra thick black lead..... $0.50

THE EAGLE DRAUGHTING PENCIL

Per doz.

No. 3795 EAGLE DRAUGHTING PENCIL, round, extra thick black lead..... $0.50

COPYING PENCILS

HARDTMUTH'S "MEPHISTO" COPYING PENCILS

No. 3800

		Dozen
No. 3800A	Hardtmuth's "Mephisto" (73B) Copying Ink Pencils, Violet	$0.75
No. 3800B	Hardtmuth's "Mephisto" (73B) Copying Ink Pencils, Black	.75
No. 3800C	Hardtmuth's "Mephisto" (73B) Copying Ink Pencils, Blue	.75
No. 3800D	Hardtmuth's "Mephisto" (73B) Copying Ink Pencils, Green	.75
No. 3800E	Hardtmuth's "Mephisto" (73B) Copying Ink Pencils, Red	.75

No. 3801

		Dozen
No. 3801	Hardtmuth's "Mephisto" (77) Copying Ink Pencils, with red tip, or mouthpiece. Violet only	$0.75

THE VENUS COPYING PENCIL

No. 3805

		Dozen
No. 3805	Venus Copying Pencil (165) medium soft, Violet	$1.00
No. 3806	Venus Copying Pencil (168) hard, Violet	1.00

No. 3807

		Dozen
No. 3807	Venus Copying Pencil (171) medium soft, with white tip or mouthpiece, Violet	$1.00
No. 3808	Venus Copying Pencil (170) hard, with white tip or mouthpiece	1.00

Special quotations on any of above pencils in quantities.

For prevailing prices see latest supplementary price list.

PENCIL POINT PROTECTORS AND PENCIL LENGTHENERS

No. 3810

		Dozen	Each
No. 3810	"ALCO" one-piece Pencil Lengthener, aluminum	$1.00	$0.10
No. 3811	"ALCO" one-piece Pencil Lenthener, fiber	1.00	.10

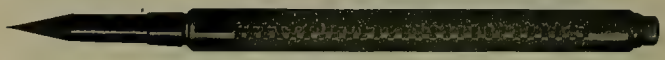
"ALCO" one-piece Pencil Lengtheners Nos. 3810-11 are most efficient. Made of one piece, eliminating all chances of any part becoming loose or wobbly. The Pencil stubs may be screwed in at either end, or one end will accommodate an eraser. The threads will grip the pencil tightly and pencil and lengthener will be as firm as one piece.

No. 3814

		Dozen	Each
No. 3814	Hexagon Wood, nickel-plated ends, threaded.....	$0.50	$0.05

No. 3816

		Dozen	Each
No. 3816	Hexagon Wood, nickel-plated ends, with sliding ring...	$1.00	$0.10



No. 3818
Length of Barrel 4 inches

		Dozen	Each
No. 3818	Economy Pencil Holder	$1.80	$0.15

The Economy Pencil Holder is made of hard rubber. It is very simple and effective. The pencil and eraser are secured by hard rubber clutches.

The pencil clutch will accommodate either hexagon or round pencils of varying sizes and is reversible so that the point may be protected or a double pointed pencil used.

The eraser clutch is made to take a standard size erasive tip—which can be used down to small proportions and then renewed.

Each holder is fitted with pencil and good erasive tip.

Other types of Lengtheners furnished on request.

For prevailing prices see latest supplementary price list.

PENCIL POINT PROTECTORS

No. 3820 Round

No. 3821 Hexagon

	Dozen	Each
No. 3820 Pencil Point Protectors, round, with eraser	$0.50	$0.05
No. 3821 Pencil Point Protectors, hexagon, with eraser	.50	.05

No. 3823

No. 3824

	Dozen	Each
No. 3823 Pencil Point Protector with clasp for eraser. An eraser is furnished with Pencil Point Protector No. 3823.	$0.50	$0.05
No. 3824 Pencil Point Protector, round	.50	.05

No. 3828

No. 3829

No. 3830

	Dozen
No. 3828A Hexagon Rubber Pencil Tips, gray rubber	$0.15
No. 3828B Hexagon Rubber Pencil Tips, red rubber	.25
No. 3829 Round Rubbers for Pencil Point Protectors, red rubber	.20

No. 3833

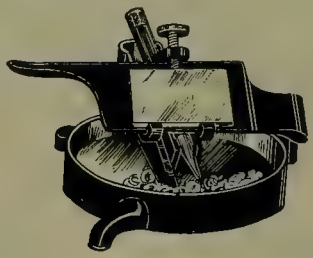
	Each
No. 3830 Metal Pencil Clips, small, for ordinary size pencils	$0.05
No. 3831 Metal Pencil Clips, large, for thick lumber pencils or fountain pen	.05

PENCIL POCKETS

	Each
No. 3833 Leather Pencil Pocket	$0.15

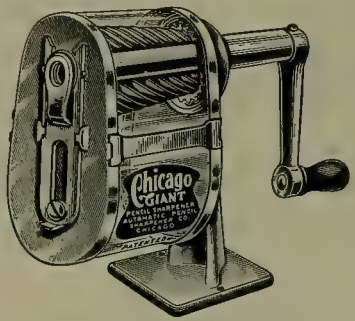
Worn inside the pocket; with metal spring to attach.

PENCIL SHARPENERS



No. 3838

	Each
No. 3838 The "Handy" Pencil Sharpener, metal, japanned	$1.00
No. 3838A Extra blades for "Handy" Pencil Sharpener	.10



No. 3840

	Each
No. 3840 The Chicago Giant Pencil Sharpener	$1.50

The Chicago Giant Pencil Sharpener sharpens every pencil and crayon, from the smallest to the largest. Automatically stops cutting when the point is produced. Will not break the leads.

No. 3845

	Each
No. 3845 Sandpaper Pencil Pointer, 1¼x4 inches, with handle	$0.10
No. 3846 Emery Paper Pencil Pointer, 1¼x4 inches, with handle	.20

No. 3848

	Each
No. 3848 Steel Lead Pencil File and Tack Lifter, 6 inches	$0.25

A convenient little tool, consisting of a steel file with a steel tack lifter at the end, black wooden handle.

For other Tack Lifters see page 525.

COLORED PENCILS

A. W. FABER'S POLYCHROME CRAYONS

Yellows

2 Zinc Yellow
3 Lemon Cadmium
4 Light Chrome
5 Light Cadmium
6 Dark Cadmium
7 Naples Yellow
8 Dark Chrome
9 Orange

Blues

21 Light Blue
22 Sky Blue
23 Cobalt Blue
24 Ultramarine
26 Paris Blue
26 Prussian Blue
27 Indigo
28 Delft Blue

Reds

31 Pink Madder Lake
32 Madder Carmine
33 Rose Pink
34 Carmine Lake
35 Carmine Extra Fine
36 Scarlet Lake
37 Saturn Red
38 Pale Vermilion
39 Dark Vermilion
46 Venetian Red
47 Brick Red
48 Terra Cotta
49 Indian Red
50 Burnt Carmine

Various

1 White
29 Red Violet Lake
30 Blue Violet Lake
57 Light Gray
58 Neutral Tint
59 Payne's Gray
60 Ivory Black

Greens

10 Terre Verte
11 Olive Green
12 Mineral Green
13 French Green
14 Green Bice
15 Sap Green
16 Hooker's Green No. 1
17 Hooker's Green No. 2
18 Veridian
19 Vegetable Green
20 Prussian Green

Browns

40 Light Ochre
41 Raw Sienna
42 Gold Ochre
43 Burnt Yellow Ochre
44 Brown Ochre
45 Burnt Sienna
51 Raw Umber
52 Bistre
53 Van Dyke Brown
54 Burnt Umber
55 Sepia
56 Warm Sepia

	Doz.	Each
No. 3850 A. W. Faber's Polychrome Crayons, listed above..	$1.00	$0.10

ASSORTED BOXES

No. 3850A Box containing assortment of 6 Polychrome Pencils...	$0.60
No. 3850B Box containing assortment of 12 Polychrome Pencils...	1.00
No. 3850C Box containing assortment of 18 Polychrome Pencils...	1.50
No. 3850D Box containing assortment of 24 Polychrome Pencils...	2.00
No. 3850E Box containing assortment of 36 Polychrome Pencils...	3.00
No. 3850F Box containing assortment of 48 Polychrome Pencils...	4.00
No. 3850G Box containing assortment of 60 Polychrome Pencils...	5.00

Other brands of Colored Pencils will be furnished on special order.

For prevailing prices see latest supplementary price list.

PAPER PENCILS

No. 3855

COLORED CRAYONS

Blaisdell Paper Colored Crayons are made in the following colors:

Black	No. 152	White	No. 156	Green	No. 153
Red	No. 161	Blue	No. 151	Light Green	No. 148
Pink	No. 162	Medium Blue	No. 149	Brown	No. 155
Orange	No. 157	Light Blue	No. 150	Purple	No. 167
Yellow	No. 154			Violet	No. 147

	Doz.	Each
No. 3855 Blaisdell Colored Paper Crayons, listed above....	$1.00	$0.10

BLAISDELL PAPER CHINA-MARKING PENCILS

Specially made for marking on glass or chinaware, in the following colors:

Black, No. 173 Red, No. 169 Blue, No. 168 Green, No. 171

	Doz.	Each
No. 3857 Blaisdell China-marking Pencils, black	$1.35	$0.13
No. 3858 Blaisdell China-marking Pencils, red, blue, green...	1.65	.15

OFFICE COLORED PENCILS

No. 3860, Round

	Dozen
No. 3860A Johann Faber's Office Red Pencils, round	$0.75
No. 3860B Johann Faber's Office Blue Pencils, round	.75
No. 3860C Johann Faber's Office Green Pencils, round	.75
No. 3860D Johann Faber's Office Yellow Pencils, round	.75
No. 3860X Johann Faber's Office Red and Blue combined, round..	1.00

No. 3861, Hexagon

	Dozen
No. 3861A Johann Faber's Office Red Pencils, hexagon	$0.75
No. 3861B Johann Faber's Office Blue Pencils, hexagon	.75
No. 3861C Johann Faber's Office Green Pencils, hexagon	.75
No. 3861D Johann Faber's Office Yellow Pencils, hexagon	.75
No. 3861X Johann Faber's Office Red and Blue combined, hexagon	1.00

For prevailing prices see latest supplementary price list.

LUMBER PENCILS AND CRAYONS

MARKING PENCILS

These pencils are specially adapted to the use of mechanics, carpenters and joiners. Round, 7 inches long.

	Dozen
No. 3865 A. W. Faber's Marking Pencils, Black, in white wood	$0.60

LUMBERMEN'S PENCILS

These pencils are used for marking timber. The lead is extra thick, and will mark on damp wood. Round, 7 inches long.

	Dozen
No. 3868A A. W. Faber Lumbermen's Pencil, Red	$1.00
No. 3868B A. W. Faber Lumbermen's Pencil, Blue	1.00
No. 3868C A. W. Faber Lumbermen's Pencil, Green	1.00
No. 3868D A. W. Faber Lumbermen's Pencil, Black	1.00

DIXON'S LUMBER CRAYONS

No. 3871

Japanned

	Dozen
No. 3870 Dixon's Lumber Crayons, black only, Japanned in the following degrees: Regular, No. 361; Soft, No. 365; Very Soft, No. 365½	$0.60

NOTE—Nos. 365 Soft and 365½ Very Soft are used on green lumber.

Paper Covered

	Dozen
No. 3871A Dixon's Lumber Crayons, paper covered, Red	$1.00
No. 3871B Dixon's Lumber Crayons, paper covered, Blue	1.00
No. 3871C Dixon's Lumber Crayons, paper covered, Yellow	1.00
No. 3871D Dixon's Lumber Crayons, paper covered, Carbon Black	1.00

NICKEL HOLDER FOR LUMBER CRAYONS

No. 3873

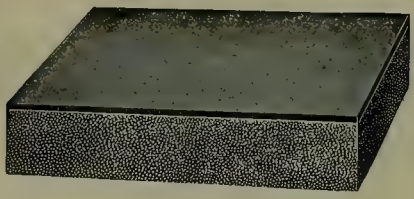
	Each
No. 3873 Nickel Holder for Lumber Crayons	$0.10

SOAPSTONE CRAYON

No. 3875

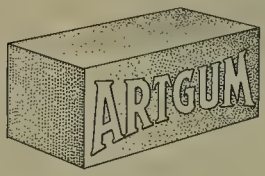
	Dozen
No. 3875 Metalworker's Soapstone Crayons, 5x¼x½ in.	$0.60

CLEANING ERASERS



No. 3880C

	Each
No. 3880A Sponge Rubber with solid back, 1 x1x1	$0.10
No. 3880B Sponge Rubber with solid back, 1½x2x1	.30
No. 3880C Sponge Rubber with solid back, 3 x2x1	.50
No. 3880D Sponge Rubber with solid back, 6 x4x1	1.80



No. 3883

No. 3884

ARTGUM

	Dozen	Each
No. 3883A Artgum, 1⅜x1⅜x1⅜ inches	$0.60	$0.05
No. 3883B Artgum, 2 x1 x1 inches	.95	.08
No. 3883C Artgum, 2¼x1⅜x1⅜ inches	1.20	.10
No. 3883D Artgum, 3 x2 x1 inches	1.80	.15
No. 3883E Artgum, 3 x3 x2 inches	....	.30

PLASTIC OR KNEADED RUBBER

	Dozen	Each
No. 3884A Kneaded Rubber No. 1222, small	$0.50	$0.05
No. 3884B Kneaded Rubber No. 1224, large	1.00	.10

Both sizes packed 3 dozen in a box.

No. 3885

Soft and pliable, and will erase pencil marks easily and without injury to Tracing Paper or any other delicate drawing material.

No. 3885 Gray Pliable Rubbers.

Pieces to pound—	60	40	30	24	20	16	12	8	4
Each	$0.05	$0.06	$0.08	$0.10	$0.12	$0.15	$0.20	$0.30	$0.60
Per 1-pound box									$2.00

DRAFTSMEN'S ERASERS

This Rubber is soft and pliable, and will be found to erase pencil marks easily and without injury to either tracing paper or any other delicate drawing material.

	Dozen	Each
No. 3888A Pink Pearl Eraser No. 100, medium	$0.50	$0.50
No. 3888B Pink Pearl Eraser No. 101, large	1.00	.10

Note: No. 100 Medium Pink Pearl Erasers packed 2 dozen in a box.

A highly efficient pliable soft red rubber.

	Dozen	Each
No. 3890A Cerise Rubber No. 1005, small	$0.50	$0.05
No. 3890B Cerise Rubber No. 1010, large	1.00	.10

Note: No. 1005 Small Cerise Rubbers packed 3 dozen in a box.

	Dozen	Each
No. 3892A Emerald Eraser No. 111, small, double bevel.....	$0.50	$0.05
No. 3892B Emerald Eraser No. 211, large, double bevel.....	1.00	.10

	Dozen	Each
No. 3894A Ruby Eraser No. 112, small, double bevel.....	$0.50	$0.05
No. 3894B Ruby Eraser No. 212, large, double bevel.....	1.00	.10

For Rubber Tips for pencils or pencil lengtheners see page 513.

For prevailing prices see latest supplementary price list.

INK ERASERS

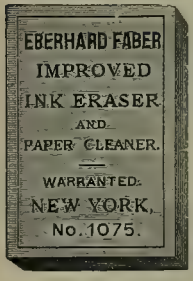
No. 3895

No. 3896

	Dozen	Each
No. 3895 Circular Pencil and Ink Eraser No. 1080.....	$0.50	$0.05
No. 3896 Comet Circular Eraser No. 1087; same as No. 1080 with brush	1.00	.10

	Dozen	Each
No. 3898A Union Ink and Pencil Eraser No. 110, small.....	$0.50	$0.05

	Dozen	Each
No. 3900A Typewriter Eraser No. 102, small, double bevel..	$0.50	$0.05
No. 3900B Typewriter Eraser No. 104, large, double bevel..	1.00	.10

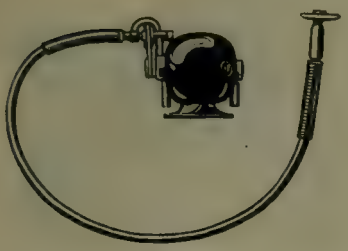


No. 3902

No. 3903

	Hundred	Each
No. 3902A Ink Eraser, 1x1½ inches, No. 1075.....	$4.00	$0.05
No. 3902B Ink Eraser, 1¼x1⅞ inches, No. 1077.....	8.00	.10
Both sizes packed 25 pieces to the box.		
	Dozen	Each
No. 3903 Van Dyke Soft Ink Eraser, 2¾x1⅛ inches, No. 6500	$1.00	$0.10

INK ERASER



No. 3905

MOTOR DRIVEN TYPE

This outfit consists of a rapidly revolving circular eraser driven through a flexible shaft 3 feet long by means of a small motor, which may be attached to any convenient lighting socket and will operate on either direct or alternating current. A cleaning rubber is arranged to touch the rotating circular eraser very gently and remove the ink which would otherwise collect; adjustment is made by the movement of a sleeve on the handle of the erasing head.

No. 3905 Motor-Driven Erasing Machine $40.00
No. 3906 Circular Erasers for Motor-Driven Erasing Machine. Per dozen ..... .50

THE BLAISDELL SPUN-GLASS ERASER

No. 3908

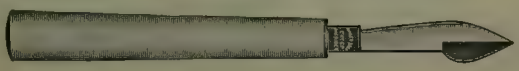
	Dozen	Each
No. 3908 Blaisdell Spun-Glass Erasers	$1.00	$0.10

For making ink erasures.

STEEL ERASERS

Style "A"

	Each
No. 3810 Steel Eraser, Style A, cocoa handle, domestic.....	$0.35
No. 3811 Steel Eraser, Style A, cocoa handle, imported.....	.60
No. 3812 Steel Eraser, Style A, bone handle, domestic	.50
No. 3813 Steel Eraser, Style A, bone handle, imported	.75



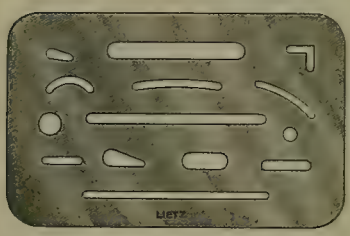
Style "B"

	Each
No. 3815 Steel Eraser, Style B, cocoa handle, domestic.....	$0.50
No. 3816 Steel Eraser, Style B, cocoa handle, imported	.75
No. 3817 Steel Eraser, Style B, bone handle, domestic	.75
No. 3818 Steel Eraser, Style B, bone handle, imported.....	1.00

INTERCHANGEABLE FORM

No. 3820 Steel Eraser, long handle with removable knife ..... .15
No. 3820E Extra Knife for No. 3925 ..... .10

ERASING SHIELDS

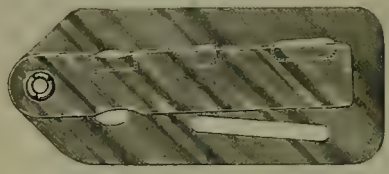


No. 3922

No. 3926

Size 2⅜x3¾ inches.

	Doz.	Each
No. 3922 German Silver Erasing Shield, 14 holes.....	$2.50	$0.25
No. 3924 Razor Steel Erasing Shield, 14 holes	1.50	.15
No. 3926 Razor Steel Erasing Shield, 9 holes	1.50	.15



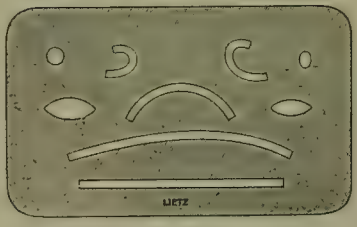
No. 3927

Size 1⅞x4½ inches.

	Doz.	Each
No. 3927 Adjustable metal Erasing Shield	$3.50	$0.30

By means of a movable arm, any desired aperture may be obtained.

CELLULOID ERASING SHIELDS



No. 3929

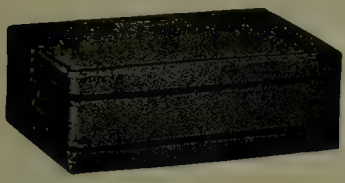
	Doz.	Each
No. 3929 Transparent Celluloid Erasing Shield, 3x5 inches...	$2.00	$0.20
No. 3930, same as No. 3029 but pattern No. 3922	1.50	.15

For prevailing prices see latest supplementary price list.

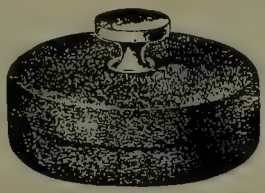
CHART AND PAPER WEIGHTS

No. 3933

	Each
No. 3933 Paper Weights, canvas bags loaded with shot, 1½ lbs.....	$0.50

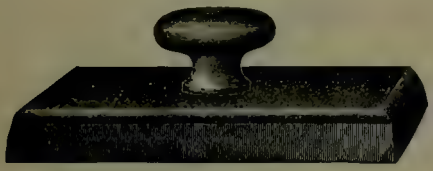


No. 3934



No. 3935

	Each
No. 3934 Square, iron, leather-covered Paper Weight, 2½x2x1½ inches, 1½ lbs.	$0.50
No. 3935 Round, iron, green cloth-covered Paper Weight, 2½ inches diameter, 1 lb.	.60



No. 3936

No. 3937

	Each
No. 3936 Square, iron, japanned Paper Weight, 3x7½ inches, 2¾ lbs.	$0.75
No. 3937 Round, iron, japanned Paper Weight, 2¾ in. diam., 1½ lbs.	.50

See also Ink-Bottle Holders and Paper Weights, page 497.

For prevailing prices see latest supplementary price list.

THUMB TACKS

Nos. 3940-42 Nos. 3944-46

GERMAN SILVER—BEST QUALITY

The pins are of hardened steel, screwed in and riveted.

Flat Heads

		Dozen
No. 3940	German silver Thumb Tacks, flat heads, 3/8 inch diameter, carded	$0.60
No. 3941	German silver Thumb Tacks, flat heads, 1/2 inch diameter, carded	.70
No. 3942	German silver Thumb Tacks, flat heads, 5/8 inch diameter, carded	.90

Beveled Heads

		Dozen
No. 3944	German silver Thumb Tacks, beveled heads, 3/8 inch diameter, carded	$0.60
No. 3945	German silver Thumb Tacks, beveled heads, 1/2 inch diameter, carded	.70
No. 3946	German silver Thumb Tacks, beveled heads, 5/8 inch diameter, carded	.90

GERMAN SILVER—GOOD QUALITY

The pins are riveted, preventing them from pushing through.

Flat Heads

		Dozen
No. 3950	German silver Thumb Tacks, flat heads, 3/8 inch diameter, carded	$0.25
No. 3951	German silver Thumb Tacks, flat heads, 1/2 inch diameter, carded	.30
No. 3952	German silver Thumb Tacks, flat heads, 5/8 inch diameter, carded	.45

Beveled Heads

		Dozen
No. 3954	German silver Thumb Tacks, beveled heads, 3/8 inch diameter, carded	$0.25
No. 3955	German silver Thumb Tacks, beveled heads, 1/2 inch diameter, carded	.30
No. 3956	German silver Thumb Tacks, beveled heads, 5/8 inch diameter, carded	.45

BRASS—GOOD QUALITY

Riveted Pins—One Dozen on a Card.

No. 3960 No. 3961 No. 3962

Flat Heads

		Gross	Dozen
No. 3960	Brass Thumb Tacks, flat heads, 3/8 inch diameter	$1.65	$0.15
No. 3961	Brass Thumb Tacks, flat heads, 1/2 inch diameter	1.80	.20
No. 3962	Brass Thumb Tacks, flat heads, 5/8 inch diameter	2.00	.25

No. 3965

UNIVERSAL THUMB TACKS

These tacks are made of one solid piece of metal, nickel plated, with a knife edge, enabling the T-square or scale to ride over without annoyance or injury. Furnished with a special puller, which engages two holes in the head of the tack. The tacks are pulled out without bending the pin or injuring the edges.

		Dozen
No. 3965	Universal Center Pull Thumb Tacks, 1/2 inch diameter, 1 dozen in box with puller	$0.40

For prevailing prices see latest supplementary price list.

THUMB TACKS

Nos. 3970-3973
Stamped Steel

These Tacks are stamped out of one piece of hard steel and are of the best quality, and have needle-finished points.

Loose, in Boxes

	Box of 100
No. 3970 Steel Stamped Thumb Tacks, 5/16 in. diameter	$0.45
No. 3971 Steel Stamped Thumb Tacks, 3/8 in. diameter	.55
No. 3972 Steel Stamped Thumb Tacks, 7/16 in. diameter	.65
No. 3973 Steel Stamped Thumb Tacks, 9/16 in. diameter	.80

Carded, One Dozen on a Card

	Gross	Dozen
No. 3971C Steel Stamped Thumb Tacks, 3/8 in. diameter	$0.90	$0.10
No. 3972C Steel Stamped Thumb Tacks, 7/16 in. diameter	1.10	.15
No. 3973C Steel Stamped Thumb Tacks, 9/16 in. diameter	1.30	.20

For School Use

	Per box
No. 3974 Steel Stamped Thumb Tacks, 3/8 in. diameter, 1 dozen in tin box	$0.10

No. 3974

SOLID STEEL

Very strong and durable. Pins will not pull out or push through.

	Box of 100
No. 3975 Solid Steel Thumb Tacks, 5/16 in. diameter	$0.25
No. 3976 Solid Steel Thumb Tacks, 3/8 in. diameter	.30
No. 3977 Solid Steel Thumb Tacks, 1/2 in. diameter	.35

TACK LIFTERS

No. 3980

No. 3981

	Each
No. 3980 Tack Lifter, bronzed brass	$0.05
No. 3981 Improved Tack Lifter and Paper Cutter, nickel plated	.20

Tack Lifter No. 3981, owing to its beveled V-shape claw, catches the tack on the outside points of its circle, and by simply pushing the lifter forward, the tack is lifted without bending the pin.

For Combination Steel Lead Pencil File and Tack Lifter see Catalog No. 3848, page 514.

GLASS PUSH PINS

Steel Points

No. 4000 No. 4001

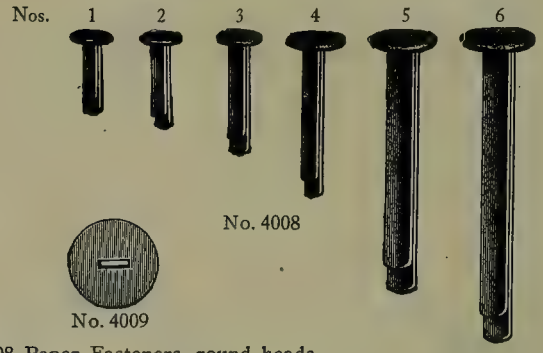
	Box of 6
No. 4000 Glass Head Push Pin, small.....	$0.10
No. 4001 Glass Head Push Pin, large.....	.10

OFFICE PINS

No. 4004

No. 4004 Pyramid Office Pins, 360 pins in the roll. Each....	$0.15
Dozen	1.75
Pyramid Office Pins can be furnished in the following sizes:	
No. 3—1¼ in. long.	
No. 4—1⅛ in. long.	
No. 5—1 in. long.	
No. 6— ⅞ in. long.	
When ordering please state size wanted.	
No. 4005 Office Pins in bulk (½ lb. boxes). Per pound.....	$3.00

BRASS PAPER FASTENERS



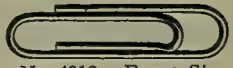
No. 4008

No. 4009

No. 4008 Paper Fasteners, round heads.						
Number—	1	2	3	4	5	6
Length, inches—	¼	½	¾	1	1¼	1½
Per box of 100.....	$0.20	$0.25	$0.30	$0.40	$0.75	$0.85
Per box of 1000.....	1.25	1.50	2.00	2.50	7.00	8.00

No. 4009 Brass Washers for paper fasteners. Per 1000..... $1.25

GEM PAPER CLIPS



No. 4012 Exact Size

	Per Box.	Per 1000
No. 4012 Gem Paper Clips, 100 in box.....	$0.10	$0.90

THE TIGER PAPER CLIP

No. 4015

Strong grip. Extra wide opening.
Gray Steel, Blue Steel Springs.

	Each
No. 4015A Tiger Paper Clip, 2½ inches long...	.....
No. 4015B Tiger Paper Clip, 1¼ inches long...	.....
No. 4015C Tiger Paper Clip, 4 inches long.....	.....

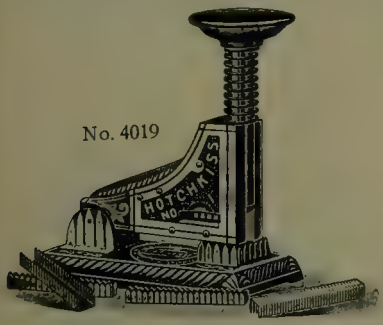
THE TRIUMPH EYELET PUNCH AND FASTENER

No. 4017

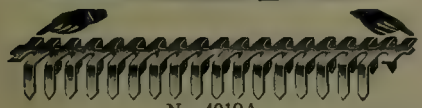
No. 4017A

	Each
No. 4017 Triumph Eyelet Punch and Fastener.....	$3.00
No. 4017A Eyelets for Triumph Punch and Fastener—	Box of 250
Short	$0.15
Medium long	.25
Long	.40

The Triumph Eyelet Punch and Fastener is made of metal, nickel plated and is superior to any other of its kind. The "gauge," which enables papers to be punched at uniform distances, is a new feature of great utility and all the obnoxious breakage of springs, etc., which continually occurs in other eyelet punches, is impossible in the Triumph.



No. 4019



No. 4019A

THE HOTCHKISS STAPLE PRESS

Holds 25 Staples.
Fed automatically.
Will fasten 2 to 25 sheets of paper.

	Each
No. 4019 Hotchkiss Staple Press including 500 staples	$2.25
No. 4019A Staples for Hotchkiss Staple Press, packed 500 in a box. Per 1000.	.90

GRAY RUBBER BANDS

No. 4025

No. 4025 Gray Rubber Bands, 1/16 inch wide, sizes Nos. 8 to 19 and Nos. 20 and 50 extra heavy. Per 1 ounce box..... $0.25
Order length by the following numbers:

No. 8— ⅞ in. long.
No. 10—1¼ in. long.
No. 11—1½ in. long.
No. 12—1⅝ in. long.
No. 13—1¾ in. long.
No. 14—2 in. long.
No. 15—2¼ in. long.
No. 16—2½ in. long.
No. 17—2¾ in. long.
No. 18—3 in. long.
No. 19—3½ in. long.
No. 20—1¼ in. long, extra heavy.
No. 50—1¾ in. long, extra heavy.

No. 4026

No. 4026 Gray Rubber Bands, ⅛ inch wide, sizes Nos. 27 to 33
Per 1-ounce box $0.25
Order length by the following numbers:

No. 27—1¼ in. long.
No. 28—1⅜ in. long.
No. 29—1½ in. long.
No. 30—2 in. long.
No. 31—2½ in. long.
No. 32—3 in. long.
No. 33—3½ in. long.

No. 4027 Gray Rubber Bands, ¼ inch wide, sizes Nos. 61 to 64.
Per 1-ounce box $0.25
Order length by the following numbers:

No. 61—2 in. long.
No. 62—2½ in. long.
No. 63—3 in. long.
No. 64—3½ in. long.

RUBBER BANDS IN BULK

Per pound
No. 4030 Gray Rubber Bands in bulk, assorted or of one size..... $2.50

For prevailing prices see latest supplementary price list.

ASSORTMENTS OF GRAY RUBBER BANDS

No. 4035A Assortment No. 100, containing Nos. 10, 12, 30, 32, 62, 64, 72, 84, 50 ..... $1.00
No. 4035B Assortment No. 200, containing Nos. 72, 62, 64, 84, 32, 50, 10, 12, 30 ..... .75
No. 4035C Assortment No. 300, containing Nos. 64, 62, 72, 84, 30, 50, 32, 10, 12 ..... .60
No. 4035D Assortment No. 400, containing Nos. 64, 72, 30, 32, 50, 10, 12 ..... .35
No. 4035E Assortment No. 500, containing Nos. 10, 12, 30, 32, 50..... .10

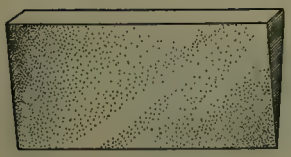
EYESHADES

	Each
No. 4040A "Featherweight" Eyeshade, of transparent green celluloid.....	$0.25
No. 4040B "Featherweight" Eyeshade, of opaque celluloid	.25

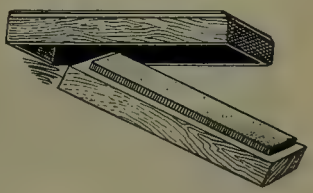
"Featherweight" Eyeshades are made from a single piece of celluloid, adjustable to fit anyone. The lightest eyeshade made.

OIL STONES

For sharpening Drawing Tools.



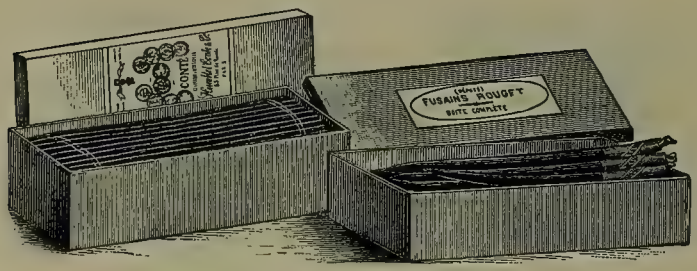
No. 4042



Nos. 4044-46

No. 4042 Arkansas Oil Stone, wedge shape, about 1¼x3 in. Each... $0.50
No. 4044 Arkansas Oil Stone, in case with cover, 3½x1 in. Each... .75
No. 4045 Arkansas Oil Stone, in case with cover, 4x1½ in. Each... 1.25
No. 4046 Arkansas Oil Stone, in case with cover, 5x2 in. Each... 2.00

CHARCOAL



No. 4050 No. 4052

	Per Box
No. 4050 Ordinary French Charcoal, 50 sticks in a box, 6 in. long	$0.15
No. 4052 Rouget, extra fine Charcoal, ends wrapped in foil, in three degrees: No. 1, Hard; No. 2, Medium; No. 3, Soft; 25 sticks in a box	.50

CONTE SAUCE CRAYONS

No. 4055

	Per Dozen
No. 4055 Conte Sauce Crayons, velvet black, wrapped in foil	$0.70

CONTE'S SQUARE BLACK CRAYONS

No. 4057

	In Boxes of 1 Gross.	1 Dozen
No. 4057 Conte's Square Black Crayons, in three degrees: No. 1, Hard; No. 2, Medium; No. 3, Soft	$1.60	$0.15

CONTE'S CRAYON PENCILS, IN POLISHED CEDAR

No. 4059

	Gross.	Dozen
No. 4059 Conte's extra fine Crayon Pencils, Black, in four degrees: No. 0, Very Hard; No. 1, Hard; No. 2, Medium; No. 3, Soft	$10.00	$1.00

For prevailing prices see latest supplementary price list.

For Charcoal Paper see page 237.

HOLDERS FOR CHARCOAL OR CRAYONS

No. 4062

	Doz.	Each
No. 4062 Brass Holders for charcoal or crayons, 4 in.....	$0.40	$0.05
No. 4063 Brass Holders for charcoal or crayons, 5 in.....	.45	.08
No. 4064 Brass Holders for charcoal or crayons, 6 in.....	.50	.10

STOMPS FOR CRAYON SHADING

No. 2 No. 4 No. 6

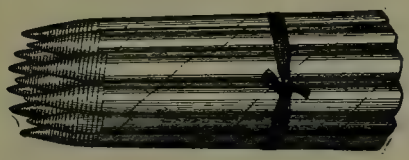
No. 4066

No. 4066 French Gray Paper Stomps for Crayon Shading.

No.—	1	2	3	4	5	6	7	8
Doz.	$0.10	$0.15	$0.15	$0.20	$0.25	$0.25	$0.30	$0.35

No. 4066A Assortment of one each Nos. 1 to 8 ..... $0.25

TORTILLON STOMPS



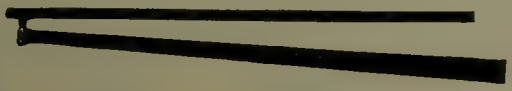
No. 4068

	Dozen
No. 4068 Tortillon Stomps, gray or white, thin paper, 3 in. long.....	$0.05
No. 4069 Tortillon Stomps, gray or white, thin paper, 5 in. long.....	.10

CHAMOIS SKINS

	Each
No. 4072 Chamois Skins, best quality, 6x 8 inches.....	$0.10
No. 4073 Chamois Skins, best quality, 12x16 inches.....	.55

ATOMIZER AND FIXATIF



No. 4075

No. 4078

	Each
No. 4075 Atomizer, japanned tin, folding.....	$0.15

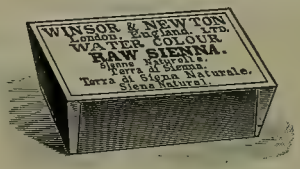
No. 4078 "Alco" Fixatif for pastel and charcoal drawings.

In bottles—	2½ oz.	4 oz.	Pint	Quart
Each	$0.15	$0.20	$0.80	$1.50
Dozen	1.80	2.40	....	....

WATER COLORS

WINSOR & NEWTON'S WATER COLORS

In whole and half Pans and Tubes.



Class 1

*Chinese White		Naples Yellow
Chrome Lemon		Neutral Tint
Chrome Yellow		New Blue
Chrome Deep		Olive Green
Chrome Orange		Payne's Grey
Cologne Earth		Permanent Blue
Dragon's Blood		Prussian Blue
Flake White		Prussian Green
Antwerp Blue	Hooker's Green No. 1	Raw Sienna
Bistre	Hooker's Green No. 2	Raw Umber
Blue Black	Indian Red	Roman Ochre
Brown Ochre	Ivory Black	Terre Verte
Brown Pink	King's Yellow	Vandyke Brown
Burnt Sienna	Lamp Black	Venetian Red
Burnt Umber	Light Red	Yellow Lake
Charcoal Grey	Mauve	Yellow Ochre

	Doz.	Each
No. 4101 W. & N. Water Colors, Class 1, whole pan or tube	$3.00	$0.25
No. 4101½ W. & N. Water Colors, Class 1, half pan.....	1.65	.15

Class 2

Alizarin Carmine	Emerald Green	Ruben's Madder
Alizarin Crimson	Gamboge	Ruby Madder (Aliz.)
Alizarin Green	Indigo	Sap Green
Alizarin Orange	Italian Pink	Scarlet Lake
Alizarin Scarlet	Leitch's Blue	Scarlet Madder (Aliz.)
Alizarin Yellow	Mars Yellow	Sepia
Brown Madder	Neutral Orange	Spectrum Red
Carmine Lake	Purple Lake	Spectrum Violet
Cerulean Blue	Roman Sepia	Spectrum Yellow
Crimson Lake	Rose Madder (Aliz.)	Warm Sepia

	Doz.	Each
No. 4102 W. & N. Water Colors, Class 2, whole pan or tube	$6.00	$0.50
No. 4102½ W. & N. Water Colors, Class 2, half pan.....	3.00	.25

Class 3

Cadmium Yellow, pale	French Blue	Ditto Transparent
Cadmium Yellow	Indian Purple	Permanent Mauve
Cadmium Orange	Indian Yellow	Permanent Violet
Cobalt Blue	Intense Blue	Pure Scarlet
Cobalt Green	Lemon Yellow	Scarlet Vermilion
Cobalt Violet	Mars Orange	Ultramarine Ash Grey
Emerald Oxide Chromium	Orange Vermilion	Vermilion
	Oxide of Chromium	Viridian

	Doz.	Each
No. 4103 W. & N. Water Colors, Class 3, whole pan or tube	$7.50	$0.65
No. 4103½ W. & N. Water Colors, Class 3, half pan.....	3.75	.35

*Chinese White in tubes and bottles, see opposite page.

For prevailing prices see latest supplementary price list.

WATER COLORS

Class 4

Aureolin	Field's Orange	Pink Madder	Rose Madder
Aurora Yellow	Vermilion	Primrose Aureolin	(Pink Shade)
Burnt Carmine	Gallstone	Purple Madder	Scarlet Madder
Carmine	Madder Carmine	Rose Doré	Violet Carmine
Cobalt Yellow	Madder Lake	Rose Madder	Yellow Carmine
	New Olive Green		

		Doz.	Each
No. 4104	W. & N. Water Colors, Class 4, whole pan or tube	$12.75	$1.10
No. 4104½	W. & N. Water Colors, Class 4, half pan.....	6.40	.55

Class 5

Smalt Ultramarine Ash

		Doz.	Each
No. 4105	W. & N. Water Colors, Class 5, whole pan or tube	$18.00	$1.50
No. 4105½	W. & N. Water Colors, Class 5, half pan.....	9.00	.75

WINSOR & NEWTON'S CHINESE WHITE
In Tubes or Bottles

No. 4110

No. 4113

No. 4115

		Doz.	Each
No. 4110	W. & N. Chinese White, small tube, ½x2 inches...	....	$0.20
No. 4111	W. & N. Chinese White, large tube, ¾x2 inches...	....	.35
No. 4112	W. & N. Chinese White, extra large tube, 1x2¾ in.	....	.65
No. 4113	W. & N. Chinese White, small bottle	....	.20
No. 4115	W. & N. Chinese White, large jar.....	....	.35

BOOKS OF WATER COLOR SPECIMENS

		Each
No. 4118	W. & N. Book of Water Color Specimens.....	$0.25

WATER COLOR STAMPS IN BOOKS

		Each
No. 4120	Book containing 12 Water Color Stamps 6x3 inches.....	$0.25

For prevailing prices see latest supplementary price list.

BOURGEOIS' FRENCH WATER COLORS

Nos. 4121-4125

No. 4138

The Bourgeois French Water Colors are put up in glass jars containing more than twice as much as the whole pans sold by other manufacturers at about the same price. They are moist and a slight rubbing of the desired colors with a moistened brush is sufficient to obtain the full richness of their tint. The colors are very brilliant in tone.

Series I

Bistre	Dragon's Blood	Olive Green
Blue Black	Extra Fine Black	Peach Black
Blue Verditer	Gamboge	Permanent White
Black Lake	Gold Ochre	Raw Sienna
Brown Ochre	Indian Red	Raw Umber
Brown Pink	Ivory Black	Roman Ochre
Burnt Italian Earth	Italian Pink	Red Ochre
Burnt Sienna	Italian Earth	Vandyke Brown
Burnt Umber	Lamp Black	Venetian Red
Cachemire Yellow	Light Red	Yellow Maize
Cassel Earth	Naples Yellow	Yellow Ochre
Cologne Earth	Naples Yellow, Greenish	

Each

No. 4121 Bourgeois French Water Colors in jars..... $0.30

Series II

Brilliant Yellow	Indian Lake	Transparent Green, Blue
Burnt Lake	Indigo	Transparent Green, Light
Chinese White	Neutral Tint	Transparent Green, Dark
Crimson Lake	Paynes Grey	Turkey Red
Crimson Lake, Dark	Persian Lake	Veronese Green
Crimson Lake, Light	Purple, Light	Violet, Light
Emerald Green	Purple, Dark	Violet, Deep
Garnet Lake	Sap Green	Violet Lake
Green Lake	Silver White	Yellow Lake
Hookers Green		

Each

No. 4122 Bourgeois French Water Colors in jars..... $0.50

Series III

Antwerp Blue	English Lake	Red Lead
Brown Madder	Emeraude Green	Rose Carthame, Light
Cerulean Blue	Geranium Rose	Rose Carthame, Deep
Carmine	Golden Yellow	Sevres Blue
Chrome Green, Light	Marine Blue	Scarlet Lake
Chrome Green, Medium	Mars Violet	Strontian Yellow
Chrome Green, Deep	Paris Blue	Transparent Blue
Chrome Yellow, Lemon	Peacock Blue	Tyrian Rose
Chrome Yellow, Light	Ponceau Lake	Ultramarine Blue, Light
Chrome Deep	Prussian Blue	Ultramarine Blue, Deep
Cyprus Green, Light	Prussian Green	Warm Sepia
Cyprus Green, Deep		

Each

No. 4123 Bourgeois French Water Colors in jars..... $0.75

Series IV

Cadmium, Lemon	Cobalt Blue	Rose Madder
Cadmium, Light	Cobalt Green	Sky Blue
Cadmium, Medium	Cobalt Violet	Scarlet Vermilion
Cadmium, Deep	Intense Blue	Vermilion, Light
Cadmium, Orange	Madder Lake, Deep	Vermilion, Deep

Each

No. 4124 Bourgeois French Water Colors in jars..... $1.25

Series V

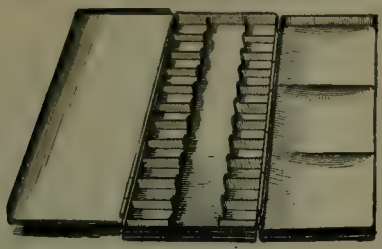
Burnt Carmine	Gallstone	Saffron Yellow
Extra Carmine	Indian Yellow	

Each

No. 4125 Bourgeois French Water Colors in jars..... $1.50

EMPTY JAPANNED TIN BOXES

For Winsor & Newton Water Colors



No. 4140 Japanned Tin Boxes for half pans, with space for brushes.

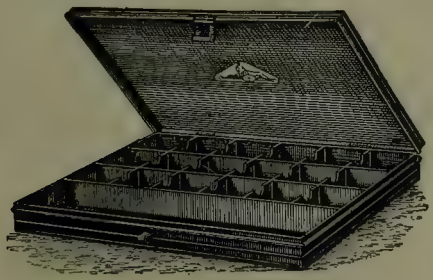
	Each		Each
6 Divisions	$0.70	18 Divisions	$1.20
8 Divisions	.80	20 Divisions	1.25
10 Divisions	.90	24 Divisions	1.35
12 Divisions	1.00	30 Divisions	1.60
16 Divisions	1.10	36 Divisions	1.85

No. 4141 Japanned Tin Boxes for whole pans, with space for brushes.

	Each		Each
6 Divisions	$0.80	16 Divisions	$1.20
8 Divisions	.90	18 Divisions	1.30
10 Divisions	.95	20 Divisions	1.35
12 Divisions	1.05	24 Divisions	1.50
14 Divisions	1.15		

No. 4142 Japanned Tin Boxes for tubes, with space for brushes.

	Each		Each
12 Divisions	$1.50	24 Divisions	$2.00
15 Divisions	1.60	30 Divisions	2.15
20 Divisions	1.75		



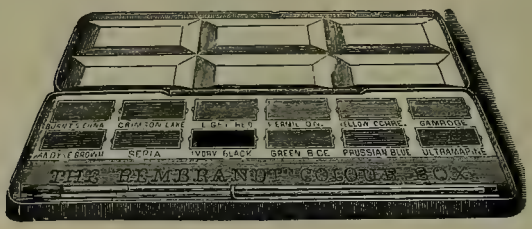
For Bourgeois Water Colors in Glass Jars

No. 4150 Japanned Tin Boxes for glass jars.	Each
18 Divisions, with space for brushes	$1.50
24 Divisions, with space for brushes	2.00

For prevailing prices see latest supplementary price list.

MOIST WATER COLORS IN JAPANNED TIN BOXES

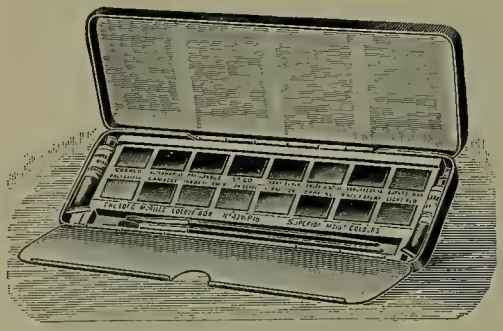
THE "REMBRANDT"



No. 4166

	Each
No. 4165 "Rembrandt" Box, with 6 moist water colors and brushes	$0.25
No. 4166 "Rembrandt" Box, with 12 moist water colors and brushes	.50

THE "MURILLÓ"



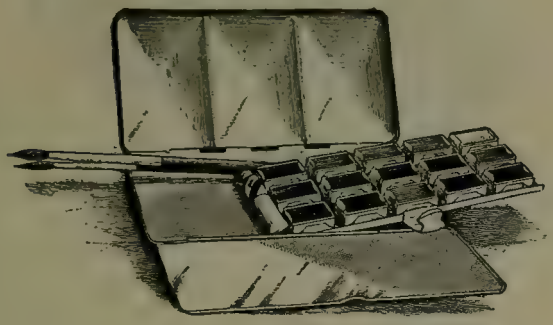
No. 4169

	Each
No. 4168 "Murillo" Box, 3½x6½ inches, with 12 moist water colors in pans, and tubes of sepia and Chinese white, with brushes	$0.80
No. 4169 "Murillo" Box, 3½x7½ inches, with 16 moist water colors in pans, and tubes of sepia and Chinese white, with brushes	1.10

For prevailing prices see latest supplementary price list.

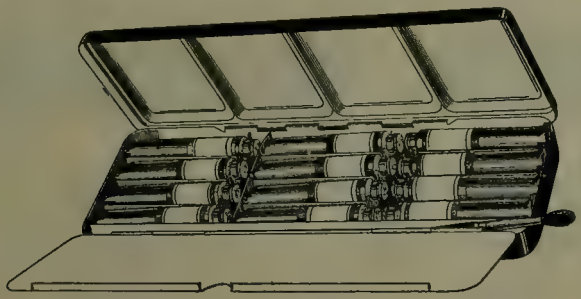
MOIST WATER COLORS IN JAPANNED TIN BOXES

IMPROVED "MURILLO"



No. 4172

		Each
No. 4171	Improved "Murillo" Box, with palette flap, containing movable tray holding 8 pans best quality moist water colors with mixing spaces and brushes, etc.	$0.85
No. 4172	Improved "Murillo" Box, with palette flap, containing movable tray holding 15 pans best quality moist water colors and tube of Chinese white, with brushes	1.35



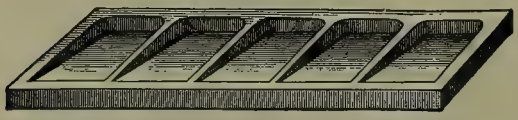
No. 4176

		Each
No. 4175	Students' Box, with palette flap, containing 8 tubes of best quality moist water colors and one fine camel hair brush	$1.25
No. 4176	Students' Box, with palette flap, containing 12 tubes of best quality moist water colors and one fine camel hair brush	1.60

For prevailing prices see latest supplementary price list.

ARTISTS' CHINAWARE

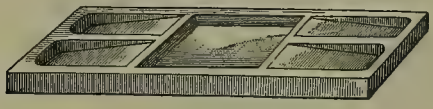
DIVIDED SLANTS



No. 4177

		Each
No. 4175	China Color Slants, 3 Slopes, 2½x4 inches	$0.15
No. 4176	China Color Slants, 4 Slopes, 3 x8 inches	.25
No. 4177	China Color Slants, 5 Slopes, 3⅛x8 inches	.30
No. 4178	China Color Slants, 6 Slopes, 3⅛x8 inches	.35
No. 4179	China Color Slants, 8 Slopes, 6⅛x7¾ inches	.45
No. 4180	China Color Slants, 10 Slopes, 6⅛x7¾ inches	.55
No. 4181	China Color Slants, 12 Slopes, 6 x7¾ inches	.70

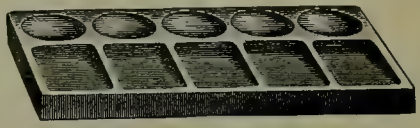
CENTER COLOR SLANT



No. 4184

	Each
No. 4184 China Center Color Slant, 5 divisions, 2⅜x6 inches	$0.20

No. 4190



No. 4195

		Each
No. 4190	China Color Slants, 3 Wells and 1 Slope, 1½x2¾ inches	$0.10
No. 4191	China Color Slants, 3 Wells and 1 Slope, 2¾x4½ inches	.25
No. 4194	China Color Slants, 3 Wells and 3 Slopes, 2¼x4 inches	.20
No. 4195	China Color Slants, 5 Wells and 5 Slopes, 4¼x7¾ inches	.45

BRUSH RESTS

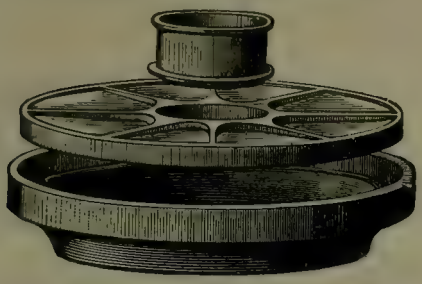
No. 4197

	Each
No. 4197 China Brush Rest, 5½ inches	$0.15

For Slate Ink Saucer, see page 499.

For prevailing prices see latest supplementary price list.

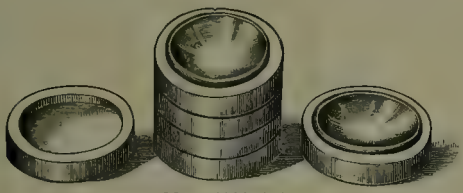
ARCHITECTS' BASIN



No. 4198

	Each
No. 4198 Architects' China Color Basin, 7 inches diameter, with 8 slopes and center cup	$1.25

CABINET NEST SAUCERS

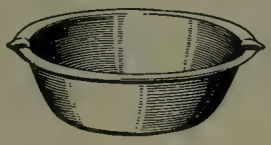


Nos. 4200-4203

	Per set
No. 4200 China Cabinet Nest Saucers, 6 in set, 2⅜ inches diameter..	$0.45
No. 4201 China Cabinet Nest Saucers, 6 in set, 2¾ inches diameter..	.50
No. 4202 China Cabinet Nest Saucers, 6 in set, 3¼ inches diameter..	.70
No. 4203 China Cabinet Nest Saucers, 6 in set, 3¾ inches diameter..	1.00

WATER GLASSES

Nos. 4206-4208



No. 4209

	Each
No. 4206 Water Glass with two lips, 2½ inches diameter.....	$0.15
No. 4207 Water Glass with two lips, 3 inches diameter.....	.20
No. 4208 Water Glass with two lips, 3½ inches diameter.....	.25
No. 4209 Water Cups, enameled tin, 3 inches diameter.....	.05

BRUSHES FOR WATER COLOR PAINTING

We offer a select assortment of Quality Brushes. They are guaranteed to contain the proper amount of hairs, and to be made of genuine sable or camel hair.

SABLE BRUSHES

In Albata, with Handle

Illustrations full size.

No. 4210 Windsor & Newton's British Red Sable Brushes, in nickel-plated ferrules, walnut polished handles.

No.—	0	1	2	3	4	5	6	7	8	9	10	11	12
Each.....	.18	.20	.25	.30	.35	.40	.60	.75	1.00	1.35	1.70	2.10	2.50

No. 4212 "Alco" Red Sable Brushes, in nickel-plated ferrules, black polished handles.

No.—	0	1	2	3	4	5	6	7	8	9	10	11	12
Each.....	.10	.10	.14	.18	.25	.35	.45	.50	.60	.80	.95	1.25	1.50

BISSELL'S SHOWCARD LETTERING BRUSHES

Illustrations full size.

These brushes are especially designed for one-stroke showcard lettering.

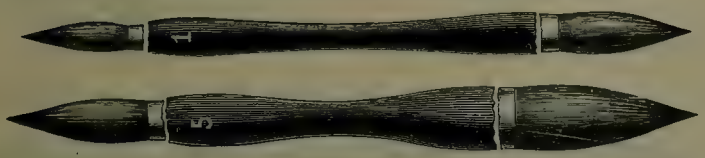
No. 4213 Bissell's Showcard Lettering Brushes, finest red sable hair in nickel-plated ferrules, polished cedar handles.

No.	1	3	5	7	9	11
Each	.10	.12	.16	.25	.30	.35

SUPERFINE CAMEL HAIR BRUSHES

For Water Color Painting

ROUND, DOUBLE END BRUSHES



No. 4215 Superfine Camel Hair Brushes, round, one brush at each end of the handle.

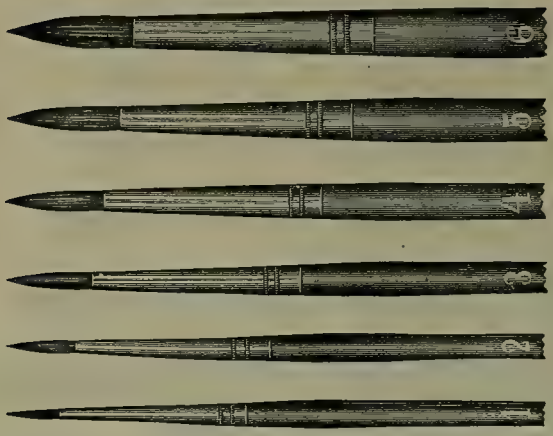
No.	1	3	5
Dozen	$3.00	$3.25	$4.50
Each	.30	.35	.40

For prevailing prices see latest supplementary price list.

SUPERFINE BRUSHES

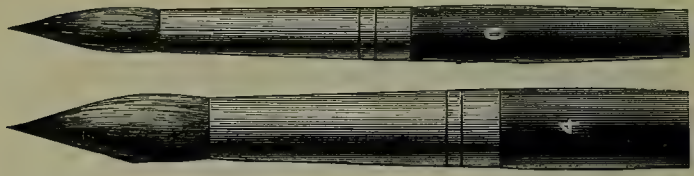
For Water Color Painting

Illustrations full size.



No. 4216 Superfine Camel Hair Brushes in tin ferrules, polished handles.

No.	1	2	3	4	5	6
Dozen	$0.60	$0.80	$0.80	$1.00	$1.00	$1.20
Each	.06	.08	.08	.10	.10	.12



No. 4217 Superfine Camel Hair Brushes in tin ferrules, **Round** for skies, washing, etc. Polished handles.

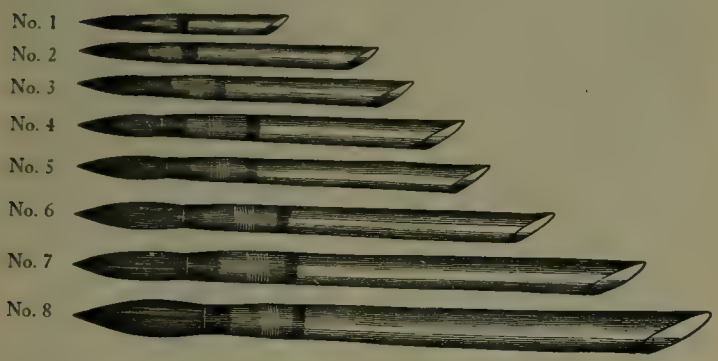
No.	0	1	2	3	4	5	6
Dozen	$2.00	$2.40	$2.85	$3.65	$4.15	$5.00	$6.25
Each	.20	.25	.30	.35	.40	.50	.65

No. 4218 Superfine Siberian Brushes in tin ferrules, **Flat** for skies, washing, etc. Polished handles.

No.	0	1	2	3	4	5	6
Dozen	$2.00	$2.40	$2.85	$3.65	$4.15	$5.00	$6.25
Each	.20	.25	.30	.35	.40	.50	.65

BRUSHES IN QUILLS

Illustrations full size.



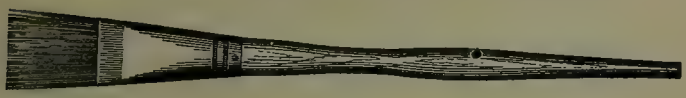
No. 4220 Red Sable Brushes in quills, best quality.

No.	1	2	3	4	5	6	7	8
Dozen	$1.20	$1.50	$2.00	$2.50	$3.00	$3.50	$5.00	$6.00
Each	.12	.15	.20	.25	.30	.35	.50	.60

No. 4221 Camel Hair Brushes in quills, fine quality.

No.	1	2	3	4	5	6	7	8
Dozen	$0.50	$0.50	$0.60	$0.60	$0.80	$0.80	$1.00	$1.00
Each	.05	.05	.06	.06	.08	.08	.10	.10

PHOTO-LIBRARY PASTE BRUSHES



No. 4225

No. 4225 Photo-Library Paste Brushes, white bristles, cedar handles, nickel ferrules.

	Doz.	Each
No. 0— ½ inch wide.....	$1.00	$0.10
No. 1— ¾ inch wide.....	1.25	.15
No. 2—1¼ inch wide.....	2.40	.25

For prevailing prices see latest supplementary price list.

TOPOGRAPHIC MAPS

We carry the full line of Topographic and Geological Quadrangles and folios, as well as the special district sheets, as published by the United States Geological Survey for the States of Arizona, California, Idaho, Nevada, Oregon and Washington, also Alaska. Each 15c.

Guide or Index Sheets sent on application.

SPECIAL MAPS AND SHEETS PUBLISHED BY THE U. S. GEOLOGICAL SURVEY

Of Alaska

Map of Alaska, scale 1:5,000,000, 1912 ..... $0.30
Map of Alaska, scale 1:1,500,000, 1915 ..... 1.00

Of the State of Arizona

Bright Angel, Ariz. This map, with the Shinumo and Vishnu maps, shows a portion of the Grand Canyon. Limiting parallels, 36° and 36° 15′. Limiting meridians, 112° and 112° 15′. Size, 21 by 26 inches. Scale, 1:48,000, or 4,000 feet to 1 inch. Contour interval, 50 feet. A brief geologic history of the Bright Angel quadrangle is given on the back of the map..... .30

Shinumo, Ariz. This map, with the Bright Angel and Vishnu maps, shows a portion of the Grand Canyon. Limiting parallels, 33° 05′ and 36° 20′. Limiting meridians, 112° 15′ and 112° 30′. Size, 25½ by 29 inches. Scale, 1:48,000, or 4,000 feet to 1 inch. Contour interval, 50 feet ..... .30

Vishnu, Ariz. This map, with the Bright Angel and Shinumo maps, shows a portion of the Grand Canyon. Limiting parallels, 36° and 36° 15′. Limiting meridians, 111° 45′ and 112°. Size, 21 by 28 inches. Scale, 1:48,000, or 4,000 feet to 1 inch. Contour interval, 50 feet ..... .30

Of the State of California

Bakersfield, Cal. This map shows part of Kern County. Limiting parallels, 35° 22′ 30″ and 35° 37′ 30″. Limiting meridians, 118° 52′ 30″ and 119° 07′ 30″. Size, 16½ by 20 inches. Scale, 1:62,500, or about 1 mile to 1 inch. Contour interval, 20 feet..... .15

TOPOGRAPHIC MAPS

Colorado River Valley, California-Arizona. This map is printed in 4 sheets (one-color photolithographs) and shows the Colorado River Valley between Parker and Yuma, Ariz. Sheet 1, limiting parallels, 33° 45′ and 34°; limiting meridians, 114° 18′ 49″ and 114° 33′ 41″. Size 31½ by 39½ inches. Contour interval, 10 feet. Sheet 2, limiting parallels, 33° 30′ and 33° 45′; limiting meridians, 114° 25′ 51″ and 114° 47′ 30″. Size, 36 by 45½ inches. Contour interval, 10 feet. Sheet 3, limiting parallels, 33° 15′ and 33° 30′; limiting meridians 114° 33′ 29″ and 114° 47′ 30″. Size, 29 by 39½ inches. Contour interval, 5 feet. Sheet 4, limiting parallels, 33° and 33° 15′; limiting meridians 114° 27′ 30″ and 114° 43′ 41°. Size, 26 by 35 inches. Contour interval, 5 feet. Scale of each sheet, 1:31,680, or one-half mile to 1 inch. Price of each sheet..... $0.50

Kern River Oil Field, Cal. (Revised edition of Oil Center Special map.) This map is printed in 2 sheets (north and south.) North sheet, limiting parallels, 35° 27′ 30″ and 35° 30′; limiting meridians, 118° 56′ and 119° 02′. South sheet, limiting parallels, 35° 25′ and 35° 27′ 30″; limiting meridians, 118° 56′ and 119° 02′. Size of each sheet, 20 by 33 inches. Scale, 1:12,000, or 1,000 feet to 1 inch. Contour interval, 20 feet. Price of each sheet..... .30

Los Angeles, Cal. Limiting parallels, 34° and 34° 15′. Limiting meridians, 118° and 118° 30′. Size, 20 by 33 inches. Scale, 1:62,500, or about 1 mile to 1 inch. Contour interval, 50 feet.. .30

Point Conception Sheet (North I 10) of International Map of the World. This sheet is a ten-color lithograph representing the California coast adjacent to Point Conception. The altitudes of the land and the depths of the ocean are shown by contour lines and tints. Limiting parallels, 32° and 36°. Limiting meridians, 120° and 126°. Size, 24 by 27 inches. Scale, 1:1,000,000, or, 15.78 miles to 1 inch ..... .60

Sacramento Valley, Cal. This is a topographic map of the Sacramento Valley from Red Bluff to Suisun Bay. Limiting parallels, 38° and 40° 15′. Limiting meridians, 121° and 122° 15′. Size, 21 by 43 inches. Scale, 1:250,000, or about 4 miles to 1 inch. Contour interval, 25 feet ..... .40

Sacramento Valley, Cal. This map is printed in 10 sheets, B, C, D, E, H, K, N, O, P and Q (three-color photolithographs), and shows the lower Sacramento Valley from latitude 38° to 39° 50′. Sheet B, limiting parallels, 39° 30′ and 39° 40′; limiting meridians, 121° 58′ and 122° 22′. Size, 26½ by 45½ inches. Sheet C, limiting parallels, 39° 20′ and 39° 30′; limiting meridians, 121° 59′ and 122° 21′. Size, 30 by 43 inches. Sheet D, limiting parallels, 39° 10′ and 39° 20′; limiting meridians, 121° 55′ and 122° 22′. Size, 26½ by 52 inches. Sheet E, limiting parallels 39° and 39° 10′; limiting meridians, 121° 50′ and 122° 17′ 30″. Size, 26 by 51½ inches. Sheet H, limiting parallels, 38° 40′ and 38° 50′; limiting meridians, 121° 30′ and 121° 50′. Size, 28 by 40 inches. Sheet K, limiting parallels, 38° 30′ and 38° 40′; limiting meridians, 121° 50′ and 122° 06′. Size, 27 by 33 inches. Sheet N, limiting parallels, 38° 20′ and 38° 30′; limiting meridians, 121° 50′ and 122° 03′. Size, 27 by 29 inches. Sheet O, limiting parallels, 38° 10′ and 38° 20′; limiting meridians, 121° 50′ and 122° 10′.

TOPOGRAPHIC MAPS

Size, 28 by 41 inches. Sheet P, limiting parallels, 38° 10′ and 38° 20′; limiting meridians, 121° 30′ and 121° 50′. Size, 27½ by 39 inches. Sheet Q, limiting parallels, 38° and 38° 10′; limiting meridians, 121° 45′ and 122°. Size, 27½ by 33 inches. Scale, 1:31,680, or one-half mile to 1 inch. Contour interval, 5 feet. Price of each sheet $0.60

Salinas Valley, Cal. This map is printed in three sheets (three-color photolithographs) showing nearly all that part of Salinas River Valley which is in Monterey County. Sheet 1, size 36 by 46½ inches; limiting parallels 36° 30′ and 36° 45′; limiting meridians, 121° 22′ 30″ and 121° 45′. Sheet 2, size 36 by 47 inches; limiting parallels, 36° 15′ and 36° 30′; limiting meridians, 121° 07′ 30″ and 121° 31′. Sheet 3, size 36 by 51 inches; limiting parallels 35° 50′ and 36° 15′; limiting meridians, 120° 47′ 30″ and 121° 12′ 30″. Scale of each sheet, 1:31,680, or one-half mile to 1 inch. Contour interval, 5 feet. Price of each sheet..... .75

Salton Sink, Cal. This is a reconnaissance map (photolithograph) showing the Salton Sea and Imperial Valley, which embrace parts of Riverside and San Diego Counties, Cal. (United States), and Lower California (Mexico). Size, 17 by 21 inches. Scale, 1:500,000, or about 8 miles to 1 inch. Contour interval, 50 feet.. .15

San Francisco and Vicinity, Cal. Limiting parallels, 37° 30′ and 38° 10′. Limiting meridians, 122° 01′ 15″ and 122° 36′ 05″. Size, 36 by 51½ inches. Scale, 1:62,500, or about 1 mile to 1 inch. Contour interval, 25 feet ..... .60

San Francisco Bay Sheet (North J 10) of International Map of the World. This sheet is a twelve-color lithograph representing San Francisco Bay and part of California and the Pacific Ocean adjacent to it. The altitudes of the land and the depths of the ocean are shown by contour lines and tints. Limiting parallels, 36° and 40°. Limiting meridians, 120° and 126°. Size, 24 by 25 inches. Scale, 1:1,000,000, or 15.78 miles to 1 inch..... .60

Southern California. This map is printed in 3 sheets. Sheet 1, limiting parallels, 33° 30′ and 34° 30′; limiting meridians, 116° 30′ and 118° 30′. Size 20 by 33 inches. Sheet 2, limiting parallels, 32° 30′ and 33° 30′; limiting meridians, 116° 30′ and 117° 45′. Size, 20 by 22 inches. Sheet 3, limiting parallels, 34° and 35°; limiting meridians, 118° 30′ and 120° 45′. Size, 22 by 36 inches. Scale of each sheet, 1:250,000, or about 8 miles to 1 inch. Contour interval, 250 feet. Price of each sheet..... .30

Yosemite National Park, Cal. The park limits established by the various acts of Congress are shown in colors. Limiting parallels, 37° 30′ and 38° 15′ 39″. Limiting meridians, 119° and 120°. Size, 29 by 31 inches. Scale, 1:125,000, or about 2 miles to 1 inch. Contour interval, 100 feet ..... .60
Same, folded between covers ..... .70

Yosemite Valley, Cal. Limiting parallels, 37° 42′ and 37° 47′ 05″. Limiting meridians, 119° 29′ 11″ and 119° 43′ 40″. Size, 19 by 38 inches. Scale, 1:24,000, or 2,000 feet to 1 inch. Contour intervals, 50 feet ..... .30

TOPOGRAPHIC MAPS

Of the States of Idaho, Montana and Wyoming

Glacier National Park, Mont. Limiting parallels, 48° 14′ 36″ and 49°. Limiting meridians, 113° 10′ and 114° 30′. Size, 31 by 35 inches. Scale, 1:125,000, or about 2 miles to 1 inch. Contour interval, 100 feet. Shows topography by shading as well as by contours $0.40

Yellowstone National Park, Wyoming-Montana-Idaho. Limiting parallels, 44° 08′ 24″ and 45° 02′ 01″. Limiting meridians, 110° and 111° 05′ 53″. Size, 32 by 36 inches. Scale, 1:125,000, or about 2 miles to 1 inch. Contour interval, 100 feet..... .40

Of the State of Oregon

Crater Lake National Park, Ore. Limiting parallels, 42° 48′ and 43° 04′. Limiting meridians, 122° and 122° 10′. Size, 19 by 22 inches. Scale, 1:62,500, or about 1 mile to 1 inch. Contour interval, 50 feet. An illustrated description of the lake and the manner of its formation is given on the back of the sheet..... .15

Mount Hood, Oregon-Washington. This map shows Mount Hood and a part of the country just north and west of it. Limiting parallels, 45° 14′ 47″ and 45° 44′. Limiting meridians, 121° 38′ 56″ and 122° 15′. Size, 16½ by 20 inches. Scale, 1:125,000, or about 2 miles to 1 inch. Contour interval, 100 feet..... .15

Willamette Valley, Ore. This map is printed in several sheets (four-color photolithographs) and shows the topography by means of brown contour lines. Sheet 1, limiting parallels, 44° and 44° 07′ 30″; limiting meridians, 123° and 123° 22′ 30″. Size, 22½ by 39½ inches. Contour interval, 5 and 10 feet. Sheet 2, limiting parallels, 44° 07′ 30″ and 44° 15′; limiting meridians, 123° and 123° 22′ 30″. Size, 23 by 39½ inches. Contour interval, 5 and 10 feet. Sheet 3, limiting parallels, 44° 15′ and 44° 22′ 30″; limiting meridians, 123° and 123° 15′. Size, 20½ by 27½ inches. Contour interval, 5 feet. Sheet 4, limiting parallels, 44° 22′ 30″ and 44° 30′; limiting meridians, 123° and 123° 15′. Size, 22 by 28 inches. Contour interval, 5 feet. Sheet 5, limiting parallels, 44° 15′ and 44° 30′; limiting meridians, 123° 15′ and 123° 25′ 27″. Size, 20 by 40 inches. Contour interval, 5 feet. Sheet 6, limiting parallels, 44° 15′ and 44° 30′; limiting meridians, 122° 52′ 30″ and 123°. Size, 17 by 40 inches. Contour interval, 5 feet. Scale of each sheet, 1:31,680, or one-half mile to 1 inch. Price of each sheet.. .60

Of the State of Washington

Mount Baker District, Washington. Map shows Mount Baker and the adjacent country. Limiting parallels, 48° 30′ and 49°. Limiting meridians, 121° 23′ 18″ and 122°. Size, 9½ by 12 inches. Scale, 1:250,000, or about 4 miles to 1 inch. Contour interval, 200 feet ..... .15

Mount Rainier National Park, Wash. This map shows Mount Rainier and the remarkable natural features adjacent to it, set aside as a national park in 1899. Limiting parallels, 46° 43′ 43″ and 47°. Limiting meridians, 121° 30′ and 121° 55′. Size, 22 by 23 inches. Scale, 1:62,500, or about 1 mile to 1 inch. Contour interval, 100 feet $0.15

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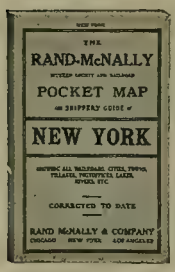

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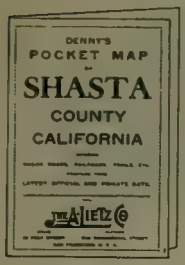

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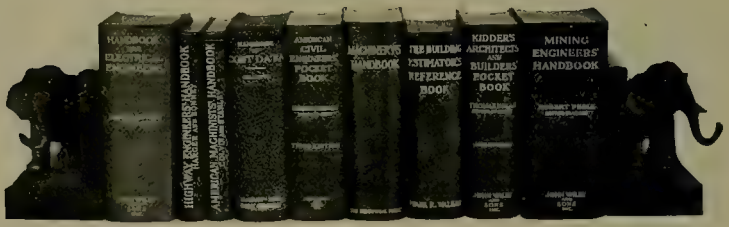

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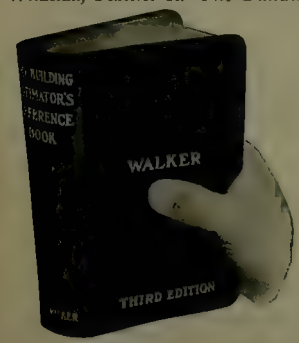

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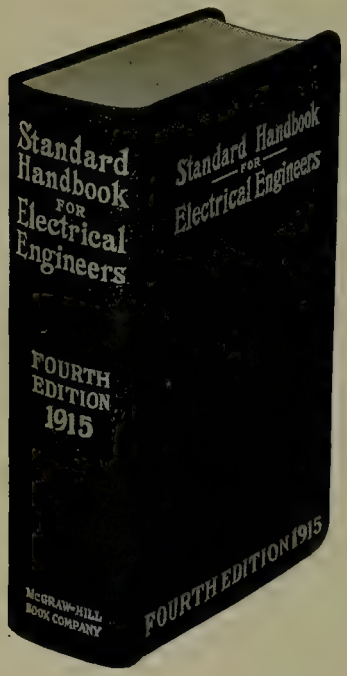

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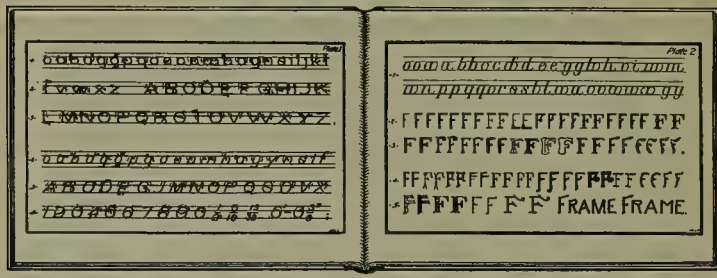

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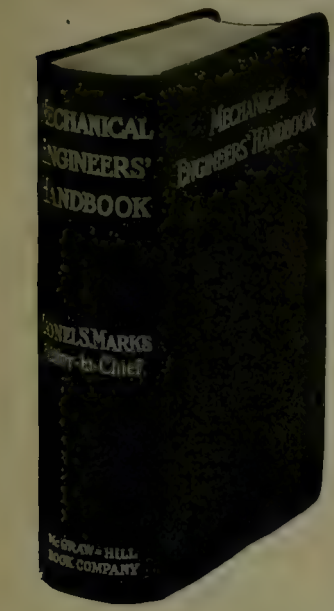

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